DOCUMENT RESUME

ED 292 608 SE 048 890

AUTHOR	Disinger, John F., Comp.
TITLE	Trends and Issues in Environmental Education: EE in School Curricula. Reports of a Symposium and a Survey. Environmental Education Information Reports.
INSTITUTION	ERIC Clearinghouse for Science, Mathematics, and Environmental Education, Columbus, Ohio.; North American Association for Environmental Education, Troy, OH.
SPONS AGENCY	Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE	Dec 87
CONTRACT	400-86-0016
NOTE	149p.
AVAILABLE FROM	SMEAC Information Reference Center, The Ohio State University, 1200 Chambers Rd., 3rd Floor, Columbus, Ohio 43212 ($10.50).
PUB TYPE	Collected Works - Conference Proceedings (021) -- Information Analyses - ERIC Information Analysis Products (071) -- Tests/Evaluation Instruments (160)
EDRS PRICE	MF01/PC06 Plus Postage.
DESCRIPTORS	Conferences; *Curriculum Development; *Curriculum Problems; *Curriculum Research; Educational Trends; Elementary Secondary Education; *Environmental Education; Instructional Effectiveness; *Interdisciplinary Approach; Models; Science and Society; Student Behavior

ABSTRACT

Charting the curricular institutionalization of environmental education, particularly as it seeks to establish an appropriate niche in the K-12 curriculum, was the focus of a recent symposium held at the annual conference of the North American Association for Environmental Education in October, 1987. Contained in this document are the papers presented at the symposium and a survey of 40 states regarding practices related to environmental education. Papers include: "By Way of Beginning: 14 Scholars, 14 Views" (Paul F. Brandwein); "WholeEarth Learning: An Infused Approach to Education about the Environment" (Cheryl Charles); "The Educational Context: Environmental Education in the School Curriculum" (Paul Hart); "Environmental Education and Student Behaviors" (Harold R. Hungerford); "Environmental Education in the School Curriculum: The Research Base" (Louis A. Iozzi); "Environmental Education in the Curriculum: It's Already There!" (David C. Engleson); "The Problem of Curriculum Infusion in Environmental Education" (Milton McClaren); "Environmental Education: The Right Product at the Right Time" (Rudolph J. H. Schafer); "An STS Perspective on Environmental Education in the School Curriculum" (Peter A. Rubba); "Alternative Curriculum Models for Environmental Education" (Chris Buethe); "(How) Can Interdisciplinarity Be Implemented?" (William F. Hammond); "Beyond Infusion and Single Subjects: The Issue of Fit of Environmental Education in the Curriculum" (Ian Robottom); "The Brain-Mind System and Infusion" (Bob Samples); "Environmental Education: Larger than a Single Curriculum" (Kay Monroe Smith); and "Environmental Education in the School Curriculum: Does It Fit?" (Jerry Hodge). John F. Disinger's "Survey Report: Current Practice: Environmental Education in U.S. School Curricula" concludes the document. The appendixes give information on the symposium participants and survey respondants and a copy of the survey form. (TW)

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Reports of a Symposium
and a Survey

Compiled and Edited by
John F. Disinger

with an Introduction by
Paul F. Brandwein

Trends and Issues
in Environmental Education:
EE in School Curricula

Published in Cooperation with
North American Association for Environmental Education

by

ERIC® Clearinghouse for Science, Mathematics, and
Environmental Education
The Ohio State University
College of Education and
School of Natural Resources
1200 Chambers Road
Columbus, OH 43212

December 1987

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ENVIRONMENTAL EDUCATION INFORMATION REPORTS

Environmental Education Information Reports are issued to analyze and summarize information related to the teaching and learning of environmental education. It is hoped that these reports will provide information for personnel involved in development, ideas for teachers, and indications of trends in environmental education.

Your comments and suggestions for these publications are invited.

John F. Disinger
Associate Director
Environmental Education

Office of Educational
Research and Improvement
U.S. Department of Education

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PREFACE

Since 1971, the ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/SMEAC) has been involved in monitoring the progress of environmental education efforts in the United States, and to some extent around the world, by identifying, collecting, indexing, abstracting, and disseminating documents of particular interest to those involved or concerned. Many mechanisms have been employed in carrying out this mission; among the most fruitful have been through cooperative efforts with the environmental education specialists of the state education agencies, and through involvement in professional associations such as the North American Association for Environmental Education (NAEE). A number of studies have been completed and publications developed from ventures involving the state education agencies. For several years, ERIC/SMEAC published NAEE's annual Current Issues series and also has participated in the development and publication of several of its monographs.

Charting the curricular institutionalization of environmental education, particularly as it seeks to establish an appropriate niche in the K-12 schools, has been a part of ERIC/SMEAC's ongoing activity. This year, the issue of institutionalization was selected as a focus for two ERIC/SMEAC activities--a survey of the state education agencies, and a symposium developed and presented at the annual NAEE conference in Quebec City. This volume includes the symposium papers and the summary report of the survey.

We are appreciative of the efforts of NAEE's 1987 conference team, including President William G. Berberet, Conference Chairman Edward J. McCrea, Program Chairman Lori D. Mann, and Executive Vice President Joan C. Heidelberg, in helping to make the symposium a viable event, as a feature of its 1987 conference, October 16-21. The all-day symposium took place at Chateau Frontenac in Quebec City on October 20th.

Special thanks are due to the 14 symposiasts, whose papers are printed in their entirety in this volume. These papers present multiple perspectives on how environmental education fits, may fit, or should fit, into school curricula; these will intrigue and enlighten all of us, as will Paul F. Brandwein's insightful introduction.

No survey can exist without input, or be of value without reasoned responses; thus, we also gratefully acknowledge the thoughtful feedback of environmental education contact persons representing 40 of the 50 state education agencies, in providing the data for a "national snapshot" of how environmental education fits into K-12 curricula.

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December 1987

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INTRODUCTION

BY WAY OF BEGINNING: 14 SCHOLARS, 14 VIEWS

Paul F. Brandwein

Consider that in a symposium of scholars in almost any field, we are obliged to consider the accommodating environment which brings them together.

We who have acknowledged our responsibility of attending to sanative environments are obliged to remind everyone that all schooling and education attends mainly, perhaps only, to the environment, and the kinds of changes in the environment that propose to bring about salutory changes in behavior. We are required to attend first to the generality of a dyad: at any moment of development an individual brings to any event or experience the totality of the interaction of DNA and environment--and this dyad, in large, tends to determine the future course of any organism's development and behavior. Further, as teachers we are obligated not to tamper with, certainly we dare not alter, the genes. But we are--as a matter of course in profession and duty--obligated to alter the environment. These broadly comprise the aptitudes and attitudes, values, and skills of the young; we act to alter them, when necessary, to the end that the young may conserve and transmit, correct and expand them in the direction of beneficence to life and living. Indeed our business is the constant improvement of environment as a superordinate quality and quantity.

We tend to cloak the instruments of change of the environment by the general names of curriculum, instruction, evaluation, yes, administration, as well--sometimes by just plain parental care and humane treatment. Sometimes we invoke those crushing terms, biological and cultural evolution (and here a subset of societal pressures). And, in time, we talk about the requirement that the schooling and educational environment include appropriate "role models," as an earnest of our approval of certain behaviors and rejection of others. We change the environments of neurons--of the organ we call the brain--to produce what we call mind. We people the mind; we know that what is not in mind cannot be in knowledge or attitude, or skill; we use what Bruner called "delivery systems," and Skinner "contingencies of reinforcement," to insure that the knowledges, attitudes and skills we--as representatives of society--wish to conserve are indeed in the valuing repertory of the young.

We press the knowledge that will, we hope, change the environment of the quality of effusions of smokestacks, exhaust pipes, chlorofluorocarbons, dioxins, poisons, pesticides, pollution and misuse of property so that the political and social environment may be readied for change. We try to monitor the knowledge of diet and drink, of drugs--alcohol, carcinogens in cigarettes, food, water and milk, the laws governing the uses of the environment to bring "pure" food and milk to the body's environment. We give all these examples, aliquot of a horde of treasured activity to bring about a sanative environment, acceptable names--child development, upbringing, schooling, education, social responsibility--but the thrust is clear: the fashioning of a sanative (synonym: healthy) environment for body-mind (a holistic state). And this fashioning of schooling as environment is, if we may call it so, an ecology of achievement: a mix of social, economic, political, culturally-specific factors in terms of the special mix of attitudes, knowledges, and skills of the educational set interacting with the set of the communities who approve or disapprove the "adopted" curriculum.

Now it is that we are concerned with another superarching and superordinate, metavaluing environment that makes possible the particular environments under our present schooling and education: we call it environmental education. Consider that this is an appellation that hides its urgency, its enormous (sic) significance for the principal practices it subsumes, beneficent life and living, and the enormity (sic) of the catastrophies the denial of its principles and practices may bring to the human condition and to the biosphere that makes the human and humane conceivable. Now it is that the symposium being convened, the symposiasts--scholars long burdened by the problems of environmental education--report their views on the kinds of "delivery systems" that are presently in use to give opportunity to teachers and the young to bring the optimums of behavior to bear on the problems of maintaining and sustaining the necessary devotion and obligation to a sensitive environment for sensitive organisms.

I am obliged to note there can be little justice in a summary, but there is the necessity of reporting 14 subtle, sometimes plangent, personal views. For they are evidence--at least to me--of the operation of an evolution, a system of selection, operating under a different constant than does the kind of evolution that selects "favored" species. But I anticipate.

Chris Buethe stresses that the "principal teachers of values should be the ones who are most concerned with environmental education." True, these are important positions of divergence and convergence necessary in summarizing a world-view of positions and advocacy but there are competent teachers who are available in all phases of schooling: thus infusion by "those who can, and most want, to do the job." He would "evaluate outcomes on the basis of individual and societal behaviors over a sufficient time period." He does see--but does not find appealing--if infusion is seen as failing, a "separate course for grade 8, simply called Earth."

In unmistakable directness, Cheryl Charles insists there is agreement "that environmental and conservation education is not a visible priority in public schools." She suggests that the "power" in determining what is actually to be taught (because there are "few state-level and provincial-level" mandates) lies with the individual classroom teacher, building principal, local school board, and parents. (Barring, I presume, mandated entry and exit testing.) She makes a case, therefore, for programs designed to stand alone (i.e., Project Learning Tree and Project WILD) which can be--and I take it should be--"infused into existing curricula." With candor she describes the limitations of the approach but proposes that it is "philosophically appropriate," "realistic." Further, she gives evidence that these approaches are making progress.

David Engleson offers his concept of what environmental education should be for grades K to 12 expressed in the intricately fashioned Wisconsin A Guide to Curriculum Planning in Environmental Education, reflecting the Tbilisi Declaration. Awareness, knowledge, attitudes, skills and participation are stressed. He finds the Curriculum Planning Guide in EE to be in consonance with Wisconsin standards requiring sequential plans in all curriculum areas, with the incorporation of environmental education objectives into all plans, truly a masterful plan for both a specific curriculum guide in EE and collaborative function in other curriculum areas.

Bill Hammond takes an analytical view of insertion or infusion. In analyzing the two he finds benefits in both, but notes also the possibility of hybridization. He presents us with "Key Operating Concepts" that guide him in "considering the totality of relationships that define the system as an integrated whole." They are eminently worth contemplating. His aim: "long-term sustenance" of a significant body of knowledge, attitudes, skills and of a total view of the curriculum; his ideal is not only "a holistic program which infuses its instructional goals and objectives in every class, in every subject, every day," but also "a comprehensive program that consists of discrete courses" and "in-depth" units of study which become the responsibility of a variety of classes. He seeks an integrated whole; after all, the environment is integrated in a whole.

Paul Hart provides a necessary point of view: he urges the need to develop a view why environmental education "has followed its particular course of evolution." He argues that a significant paradigm shift is about to emerge, and posits that environmental educators cannot suffer a single or even a dual approach, but that the problems of the world are multifaceted and that educators reflecting this multifactorial mode "must continue a multifaceted approach to educational change." His suggestions and his referents parallel his objectives. He concludes that "environmental education is an idea that is very close to achieving the critical mass to propel it to educational significance;" the goal is "environmental literacy." He posits a critical problem, to wit: environmental education must direct its attention to education of teachers and the professional development of practicing teachers: we "must begin to clarify conflicting conceptions of how to change teachers."

Jerry Hodge insists that environmental education "should be consistent with the philosophical dimensions" of how the environment is understood by those in the field. He touches on those who tend to Cartesian "duality," and those who lean to the encompassing synthesizing view of Bateson's Mind and Nature which unifies rather than dualizes. Thus, he concedes the unifying position of the Belgrade Charter that Engleson has posited as the base for the Wisconsin program. He admires Project WILD and Project Learning Tree as examples of curriculums that are balanced. Thus he comes down hard on the side of integration, wholeness, and balance. His conclusions compel examination, reflection, and conceptualization into any planning model.

Harold Hungerford assists us by a carefully constructed comparison of two options: an investigative skill approach (developing in students the skills involved in the investigation and resolution of issues) and a case study approach (an issue case study of a single environmental issue, i.e., acid-rain controversy) as significant components of environmental education. He proceeds to analyze, then to interpret, how these two methodologies can permeate the curriculum in infusion, insertion, integration. Or, if you will, whatever term one wishes to use to convey the thought that problem-finding and problem-solving--that is, "indepth issue investigations"--are central to environmental education. He wishes to change student behavior; thus he concludes "we must attend to our goals initially and our curricular strategies secondarily."

Louis Iozzi summarizes for us an eclectic and equable view; he considers that "whether environmental education is included in the curriculum as a separate subject, or if it is integrated and taught as part (of) another subject normally found in the schools," he assumes "it will be taught in an interdisciplinary manner." Indeed, this view is in the warp and woof, the undergirding assumption of all the papers, for environmental education is indeed the environment of the biosphere, hence the totality of life and living. Integral to the term environment is the integrity of the whole. Iozzi takes pain to point up the critical lesson, the "body of literature sheds very little light on our symposium question." But as we shall see, decisions upon vital questions do not always depend on the stately cadence of research. Indeed, Iozzi insists that whether EE is infused, inserted, integrated, that "environmental concepts appropriate to the discipline must be actually written into the curriculum to insure that over the course of the child's schooling, he or she receives a full environmental education."

Milton McClaren carefully argues the advantages and disadvantages of both infused and mandated programs and notes that "either option has its strengths and its weaknesses." He posits convincingly that "successful curriculum implementation, whether of infused or mandated programs, depends on a social transaction with the teacher, a transaction in which the teacher is given an opportunity to participate, to become a co-developer as well as a user of the program." Thus the teacher becomes a part of a team with a "sense of common, valuable purpose," an end eminently desirable and conceivable.

Ian Robottom puts it straightaway. He states: "While I recognize the strong philosophical justification of environmental education as diffusion, I believe I have seen more successful EE provision in the form of separate subjects. By success here, I mean in terms of adherence to the critical, politicized prescriptions of EE emanating from the UNESCO EE program. When infusion is attempted, I have seen many instances of what I could call solicitous surrender." He makes short shrift of "co-option" and interpretations which ignore the socially critically "education for the environment, apparently stressing "the ecologically oriented and consequently safe and as-you-were education about the environment." If I read him aright, he does not wish to abandon the "critical political edge" of environmental education, whether or not the models are "infusion" or "insertion" of subject matter throughout the school years.

Peter Rubba undertakes the important role of differentiating Science-Technology-Society and Environmental Education issues; Volk and Disinger in prior articles argue that EE education is "in fact, STS education." Rubba's distinctions are significant: "overt ecological connections," e.g., energy consumption, water and land use, waste management (and I infer general issues of pollution, pesticides, predation, resource management) may be relegated to EE issues. STS issues are to Rubba of a more extended and covert nature, in which nevertheless science-technology are "easily recognized," i.e., sexually transmitted disease, right to life/death, technology in the workplace, organ transplantation. Rubba favors infusion of "societal" issues of the EE flavor, investigative and action units into the middle-junior and secondary science curriculum. In fact, he argues it is conceivable that EE and STS are in the position of subsuming each other, and to the reader the possibility is offered that it doesn't really matter, as long as it is done.

Rudy Schafer, from his vantage point as a state-level coordinator of EE in California, follows another route: he suggests vectors (the "shaggy dogs" of curriculum) that may be used to carry EE issues into the curriculum, as an example, new interests in drug abuse, drop-outs, teenage suicide--the relationships of environmental pollution and personal pollution via drugs, alcohol, tobacco. From his propositions we may infer that the understanding of bureaucracy and the policies and politics of curriculum in decision-making bodies are useful tools in advancing proposals and projects. He insists that over 30 years great progress has been made. Indeed it has.

Bob Samples strikes a different chord. He takes off from "wet" (chemical transmission) and "dry" (electrical transmission) as models of brain function and synthesizes these into the complex of left-right, triune, and holonomic models. The point: learning is a matter of the ecologies that are embraced in the brain-mind system.

The brain then "learns" both pattern and discrete experience in a continuous change--symbolic of evolutionary change. In short, growth means openness to experience; learning is an open-system experience. Behaviorism then, on the other hand, is a closed system. Further, modern derived experience, that is, "information transmitted via electronic media (tending to a closed system) is information that substitutes for natural experience--an open system." He insists that because environmental education is devoted to both--the cultural experience of mediated closed systems and open systems--EE must be open to both. Thus he poses the dilemma: "on one hand, we honor the universe of mediated experience as organized by our cultural biases, and on the other we are exposed to the un-mediated dominion of natural systems where the mind must create reference." Thus, "the whole learner is not honored when either is ignored."

Kay Monroe Smith brings the propositions of educational research to the discussion. Thus she uses Tyler's four imperatives of curriculum development to analyze EE curricular thrusts, a procedure much used by developers of curriculum. Using a children's nationwide survey, she finds that 97% of environmental educators polled favored some form of a multi-disciplinary organization. She notes that this integrated approach is congruent with Linke's definition of environmental education as education "about the environment, for the environment, in the environment." Her wide-ranging paper is then a basis for valid consideration by curriculum specialists who are considering the question: "Why," "How," "Where," "When" EE education?

In my interpretation--unjust in the space allotted--I admit error, but not injustice. For the 14 authors have a just claim to the attention of the reader; it is not a mere courtesy that is demanded, but the intense conviction of those who honor life and living in its most generous sense. It is as well one of the requirements of the new age where environmental education stands poised. Interpreting Walter Truett Anderson, an environmental education as an individual undertaking is in a way concerned with "the larger truth about one's personal citizenship in the biosphere." But a certain truth is open to us "because the post-modern world is all around us and within us, and the knowledge of how it works is there to be discovered in the homely reality of how we function as living organisms." The authors of this book undertake in 14 different individual programs of intellection, interpretations of the way schooling (sic)--not always education (sic)--intervenes in this "homely reality" by means variously called infusion, insertion, programs, courses, and the mandate of non-discretionary instruction through legislation, and the like. Thus, 14 authors have brought the universes of present practice to us and have presented fundaments from which we may advance. The fundaments may be said to be variant forms seeking a favored fit--through the cultural devices of selection--repeat, cultural selection, not natural selection.

In a word, as certain of the 14 authors, particularly Hart, Hodge, and Samples, have proposed: environmental education is both a subject and object of evolution, of a seeking for a good fit in a changing environment of schooling and education, often one of dictatorial crises. Recall that crises propel us into action, rarely in time to do "research." The question needs asking: What is to be our convenant with the young?

Recall the turmoil, and hasty decision, with which we faced AIDS; the wringing of hands and minds; we had not thought far enough ahead (blame research or habit) of the ever-present possibility of a new plague, a fresh crisis in health, that is, a catastrophic change in the environment of the human.

Now we are able to muster knowledge and attitude in defense of a small fish, small and huge birds, small and huge mammals, small and huge plants--even muster offensives against huge holes in the sky, accumulations of CFCs, and possibly accumulation of an intolerable blanket of CO_2. May we rest safely in Gregory Bateson's construct of the evolving environment?

Recall that in *Mind and Nature*, the book treasured by a good number of the 14 symposiasts, Bateson posits the dual function of a stochastic model of evolution. He demonstrates that in biological evolution, the stochastic model* consists of a *constant*, the natural environment, which acts through "Natural Selection" on *variants*, changing organisms, coming out of changing DNAs; these are *organisms* changing in the eternal trial and error of the search for fitness. Thus biological evolution may be defined as the transmission and transmutation of DNA. But Bateson--an anthropologist--attends to the alternating dominion and submission of the human in evolution. He posits another *constant*, "Learning." Thus a cultural environment acts through Cultural Selection, not Natural Selection, on its *variants*--ideas, concepts, principles, attitudes, values, that bombard the creature that learns and remembers. Thus, "learning" or "cultural evolution" is the transmission and transmutation of knowledge and values.

Thus, we may consider the human to be embraced by two forms of evolution: Biological and Cultural Evolution. The Biological with its constant, *Natural Selection*, affecting *variant* organisms, the Cultural with its constant, Learning, affecting *variant* ideas. For this moment, these are the *variant* ideas (mentifacts, socifacts, artifacts) posited by the 14 symposiasts. Further, they urge intelligently, persistently, some impatiently for an acceleration of cultural evolution in a *metavariant* of ideas: environmental education. Underlying their quest, I see a major reason for urgency. They have a certain modesty in mind; they are not willing to profess that theirs is *the* "truth." With Bateson they are willing to temper their findings and say of truth: "What remains true longer does indeed remain true longer than that which does not remain true as long." With Bronowski, they accept a certain awe in the face of the magnificence of the object of their study, the environment. With him,

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*In a stochastic model there is postulated a *constant* interacting with variety. In evolution, *varieties* are found to interact with the constant (environment).

they agree: "We should all behave as if we could find out what is true." Not putting words into their encompassing essays, they seek a pervasive speech, a pervasive attitude, an honorable behavior, an obligation that will command assent. That assent: to behave in symbiosis, to behave in a characteristic manner of the human, to express their devotion to care for a small planet with precious life maintained and sustained in a covenant with environment.

Literacy in environmental education is not enough, nor is a perdurable model, if it lacks attending to the special competence and compassion which characterize stewardship of the environment. Those who are fortunate enough to understand environment, not as a word, or even the title of a curriculum, but as a concordat between mind and nature, know that it is not something to be discussed: it must be honored in the doing. There are no alternatives. They are firm in their message: they see in the environment the processes of a marvelous orderliness, a transcendent beauty, which is a final refutation of mindlessness and purposelessness.

THE SYMPOSIUM

WholeEarth Learning: An Infused Approach to Education about the Environment

Cheryl Charles

I am delighted to have an opportunity to participate as a presenter in the NAEE Symposium on the topic, "Environmental Education in the School Curriculum: (How) Does It Fit?" The topic is fundamental to our work, particularly in the areas of elementary and secondary education.

I would like to offer some background from my perspective; define some terms as I use them; offer what I believe to be some philosophical and practical reasons for the approach I recommend; comment on some concerns I have; and leave time for some questions.

I would like to begin by offering some assumptions which serve as guiding premises for my suggestions, and with which you may decide whether you agree or disagree.

First Assumption:

Education about the environment (conservation and environmental education)--including the interaction of human and natural environments--is not a visible priority in the public schools of the U.S. or Canada today. Do you agree?

Second Assumption:

It should be. Agreement?

If we agree that it is not at present a priority, but we believe it should be, then the question becomes, "How?" How do we make conservation and environmental education a priority in elementary and secondary schooling? I would like to describe for you with some candor the approach that I am taking, with the comment that I certainly am open to questions and points of difference--particularly where the spirit is to help achieve the goal of effective conservation and environmental education for learners of all ages, now and in the future.

Let me define a few terms as I use them. Education is a process whereby learners acquire knowledge, attitudes, skills and experience for use in daily life. What kind of education a person gets, and what a person does with it, is uniquely personal and individual.

Those of us working in the field of environmental, conservation, and outdoor education add an important dimension to this definition of education that serves as our goal. We are concerned about the process of education resulting in responsible behavior affecting the environment. We are trying to develop and support a process of education whereby an individual or group of individuals acquires knowledge, skills, attitudes, experience, and commitment to result in informed decisions, responsible behavior, and constructive actions affecting the environment.

With this goal in mind, the prevailing approach that we have taken in the field of environmental education is one whereby we have attempted to integrate or infuse such concepts, attitudes, skills, and experiences into the mainstream of public schooling.

That is the prevailing model with respect to schooling--an infused or integrated approach to environmental education. It has been noticeably the model since the late 1960s.

Why are we emphasizing an infused or integrated approach, rather than trying to muster a movement to install a new required subject area--science, social studies, math, language arts, health, physical education, and environmental studies, for example?

First, for philosophical reasons. Environmental education includes all those other subjects. Many of us believe that grounding in natural systems--ecological or earth-based education, as I call it --should be the organizing foundation for all of schooling. With natural systems as our model, we do know that everything is connected to everything else. The earth, the environment, including humans' culture interacting with it, is our home--and the first classroom.

With schooling, we can see that curricula are basically fragments. And yet every fragment can and should be seen in a larger context, as part of the whole. So we are saying that every part of the curriculum should be grounded in knowledge, attitudes, skills, and experience to result in informed and responsible decisions affecting the environment.

We are saying that environmental and conservation education is so important that it ought to pervade, to permeate the curriculum. We don't want to save this perspective only for an occasional course of study in environmental problems, or Conservation 1A. We want each and every course of study--for example, in math, science, language arts, and social studies--to be grounded in "whole Earth learning."

This is important--this overall organizational grounding for curricula does not prevent the appropriateness and usefulness of additional specialized units of study in elementary school, and specialized courses of study in secondary school. Units on conservation, wildlife, and water; courses in environmental science, environmental action, and global environmental issues--each of these, and others, are appropriate. However, philosophically we are saying this is so important--and so natural--that in addition to special courses of study where we can get them, we want environmental and conservation education to infuse, to permeate, the entire school experience of our youth.

Now, if for some reason you don't buy this argument on philosophical grounds, let's look at some practical reasons.

We have already agreed, I think, that environmental and conservation education is not a visible priority in public schools--and yet some folks have been working in this area for a long time. Why isn't it a priority? At the least, there are some things about schooling that we need to look at. Let's start with a teacher's day: in elementary school, there is a tremendous emphasis on skills--on reading, writing, artihmetic; on students' being able to evidence some competencies in skill areas; and on some demonstrable knowledge of some concepts. In secondary school, the emphasis is even more on mastery of a body of knowledge defined in a course syllabus and typically a textbook. This knowledge and these skills are all bound up in a curriculum that usually is locally determined. Local school districts and individual classroom teachers are where the power is in public schooling in North America--and in the textbooks. Some researchers have suggested that 90% of the teachers still use a textbook 90% of the time. There are state and provincial level guidelines and recommendations for schooling. There are few state-level and provincial-level mandates, and most of those are quite general. So where's the power? With the individual classroom teacher, building principal, local school board, and parents. I believe this local autonomy is one of the healthiest features of public schooling in North America. But overall, in terms of what students study and how they are taught, we are looking at an archaic system, within which it is very difficult to make change.

Therefore, I do not believe it is realistic at this time to see environmental education offered as separate courses of study--even if we wanted it that way. What I think is realistic is to work on the system incrementally, steadily, persistently--with attention to quality and effectiveness, starting with individual classroom teachers.

So that's at least part of the reason that with programs like Project Learning Tree (PLT) and Project WILD we have intentionally designed stand-alone instructional activities that can be integrated and infused into existing curricula--activities that teach concepts and skills that are already included in public school curricula--at the same time they bring concepts, skills, attitudes and experiences necessary to conservation and environmental education in the door with them. We have designed these activities to fit within curricula. We know that use of any of these activities will make some difference. We know that the more a teacher uses them, the greater the likely impact will be.

Remember again, we have said that conservation and environmental education is not a priority in public schools. This means that conservation and environmental education is not a visible reality when one examines the textbooks, courses of study, and descriptions of learner outcomes. It is my experience that the impetus for making environmental and conservation education a reality will not come without external assistance and support to teachers and school districts in a genuine partnership and cooperative effort. I have often said that educators will not do this job alone--and resource specialists from state and federal agencies, members of private organizations like the National Audubon Society and the National Wildlife Federation, and others with specific environmental expertise cannot do it alone.

That's why those of us who are interested in conservation and environmental education need to continue to work to provide quality materials and instructional opportunities for teachers through workshops and continuing professional support, to serve as catalysts, and to provide ongoing guidance and leadership.

What are the problems, the concerns, the limitations to this approach? There are a lot. I'll mention a few. First, it's what I call piecemeal, not pervasive. It's spotty. It tends to depend upon volunteerism to get the materials and services out to interested teachers. It typically depends upon teacher volunteerism to self-select to come to workshops and use materials. It depends upon the limitations and strengths of individual teachers. Some of what is done will be lacking in depth. Some will be rich. Some will be superficial.

I submit that the overall process is becoming increasingly effective. Where we have teachers teaching conservation and environmental education who were not previously, that is a measure of progress. Why do I have confidence in the process, at the same time I am working very hard, and taking nothing for granted?

First, again, I think the approach is philosophically appropriate. Second, I think it is realistic. Third, I have a tremendous respect for the dignity and professionalism of individual teachers. I want to support teachers in teaching well, creatively, effectively, substantively--toward the goal of developing informed and responsible ecological citizens. Teachers today--under present circumstances--will use what we offer in a variety of ways. As Diane Cantrell has said, in her recent Ph.D. dissertation on Project WILD's implementation in one state, teachers will use these materials in ways from what she calls "loosely anchored" to "tautly anchored." She found no evidence that teachers will infuse environmental education activities from Project WILD in an unanchored way--that is, unrelated to the curriculum. Teachers will make environmental education fit, with value within their own curriculum, especially where we give them the tools--materials, strategies, support and encouragement--to do so.

That, of course, means we have a responsibility--a lot of responsibility--to make every effort to provide teachers with tools, instructional support, and continued encouragement, with utmost attention to quality.

We know our goal for conservation and environmental education--informed and responsible behavior affecting the environment. My goal for public schools is to have every child--in every classroom throughout every year of schooling in grades from kindergarten through high school--experience education that is grounded in the environment. I want that grounding to be implicit as well as explicit. I want it to infuse and permeate--while also providing opportunities for specialization. I think such education is desperately needed, and increasingly so each day.

What can each of us do? Support the process, each in our own ways:

--at the university level, providing preservice teachers with the tools and encouragement to be conservation and environmental educators;

--in nonformal settings, because really, we want every citizen of every age to be ecologically responsible;

--in our professional activities;

--in our personal interests;

--in our volunteer efforts;

--in our compensated efforts;

--to local school boards and to parent-teacher organizations, advocating for grounding in conservation and environmental education;

--wherever possible, taking yourself, and children outside--because again, the first best teacher is the natural world itself.

As we become increasingly immersed in a high-tech information age --living what Milton McClaren has called a derived existence, not based on first-hand experience with the living world--as that phenomenon increasingly appears in this urbanized age, we must make time and create opportunities to learn by being and doing in the natural world.

Are we moving quickly enough? Are we making real progress at a rapid enough rate? I'll let you know what I think again in a few years. But there are a few indications of progress. It took us 10 years in PLT to reach about 80,000 educators in workshops. We continue to learn a few things. PLT is thankfully making steady progress. Project WILD, its younger sibling project, has now reached 100,000 educators in four years--and we're just beginning. I think within a few years we will be able to take our volunteerism-driven efforts to a new threshold where we will have attained the critical mass necessary to achieve a real visibility in public schools. Then we will see a need for an integrated approach to environmental education that takes on a new meaning. Curricula will need to be *systematically* integrated with conservation and environmental education. We're beginning to see those signs now. We're seeing some whole schools and whole districts. Wisconsin is trying to lead the way as a whole state where environmental education is truly, visibly, and effectively integrated.

We're not there yet--but that is not cause for despair. It is cause for diligence.

REFERENCES

Cantrell, Diane C. *A Case Study Analysis of Curriculum Implementation as Exemplified by Project WILD in One Midwestern State.* Ph. D. dissertation, The Ohio State University, 1987. ED 287 676.

Western Regional Environmental Education Council. *Aquatic Project WILD.* Boulder, CO: Project WILD, 1987.

Western Regional Environmental Education. *Project Learning Tree, K-6.* Washington, DC: American Forest Institute, 1977a.

Western Regional Environmental Education Council. *Project Learning Tree, 7-12.* Washington, DC: American Forest Institute, 1977b.

Western Regional Environmental Education Council. *Project WILD, Elementary Activity Guide.* Boulder, CO: Project WILD, 1983a.

Western Regional Environmental Education Council. *Project WILD, Secondary Activity Guide.* Boulder, CO: Project WILD, 1983b.

The Educational Context: Environmental Education in the School Curriculum

Paul Hart

Introduction

For more than twenty years, educators committed to the pursuit of environmental quality have endeavored to locate a place for environmental education in the school curriculum. The goal has been clear and consistent: environmental education should be a priority in the entire educational system. What has not been clear and consistent is the process or method advocated by environmental educators in their attempts to reach this goal. Whether it is necessary or even desirable to achieve more clarity or consistency in approach would probably not be important if the goal had been achieved. However, the problem of process continues to plague environmental educators because, according to leaders in the field, environmental education has not been effectively institutionalized in elementary and secondary schools.

Disinger (1984) and others have described one aspect of this process problem as a difficulty in arranging curricular space for interdisciplinary concerns. Although there are many intermediate viewpoints, two distinct positions appear to have emerged as a means of resolving this problem: integrate environmental considerations into existing curricula, or develop discrete programs of study which consider the environment, and its associated problems and issues, as a separate subject. The purpose of this paper is to explore the meaning behind this question from the perspective of a teacher educator. By providing a perspective that contributes to an understanding of pedagogical issues that effect environmental education, it is anticipated that conditions required for teacher change may be more clearly understood.

Educational Context

According to philosopher Max Black, all discussions concerning matters of importance in education eventually lead to examination of purposes and reasons. The process problem of environmental education in the school curriculum is ultimately a question of conflicting philosophies of education. On the surface the issue appears to be centered on integration. However, the underlying reasons are based on human values which, in turn, reflect conflicting worldviews, whether or not they can be articulated by those involved in the surface issue.

Environmental education is based on a worldview or a philosophical framework that, from an environmental perspective, few environmental educators would debate. It is an organic worldview that recognizes the integrity of natural systems and interacting human communities. It is in contrast to the values and assumptions which permeate a classical scientific worldview that separates humans from natural systems, disregards connections between phenomena and events in favor of disciplinary modes of thought, objectivity, and neutrality, and fails to address the multidimensionality of real world problems because of preoccupation with analysis over synthesis (Sterling, 1985). In other words, the scientific worldview has learned how to think the world to pieces, whereas an environmental worldview promotes activity that results in thinking the world back together. Conflicting philosophical viewpoints of human-environment relationships have resulted in different human actions.

Environmental education is also based on worldviews or conceptual frameworks that, from an educational perspective, environmental educators may very well debate. Conflicting conceptions of education, curriculum, and the teaching-learning process result in very different classroom behavior by teachers. Underlying rationales for varied practice include academic rationalism, in which subject matter and the structure of disciplines assumes primacy; humanism, in which individual development preoccupies educational thought; social reconstructionism, wherein societal improvement is the most important goal; and technologism, wherein goals of teachers are entirely governed by curriculum guidelines (see Eisner and Vallance, 1971). These reasons for teaching styles are fundamental to understanding teacher and school system behavior. We cannot explore questions of educational process or change without clear understanding of the philosophical positions that underlie particular teacher behaviors.

If one traces this line of reasoning to conclusion, it is apparent that environmental educators have focused their attention on the development of environment-related goals and have neglected to probe deeply enough into educational implications, particularly at the level of the teacher. The validity of environmental goals within the societal context has stood the test of time, at least in the latter half of the twentieth centruy. Environmental problems have not "gone away." Environmentalism was not a "passing fad" of the 1960s. Environmental education was not a single clap of thunder, but is a pervasive drizzle that is in many ways permeating the educational system. The concept of environmental education has had considerable influence on global ideas in the sociopolitical complex. World leaders consistently make reference to environment-related issues in their public addresses and policy initiatives. There is good reason to anticipate that, given the history of the eventual effects of the evolution of ideas in the societal context on the education system, social pressures will result in educational change, despite some frustration with lag time (Goodlad, 1979).

The process problem remains in environmental education because environmental educators have not focused on the real-life working conditions of teachers, their perceptions about change, and the support system needed to facilitate change in teaching method demanded by these new curriculum materials. However, recent evidence appears to indicate that environmental education goals and methods may become more central educational priorities. Rumblings of discontent have emerged in many traditional school subject areas.

The effect of societal pressure for change is evident in the field of science education. The current literature contains hundreds of articles which describe a crisis in school science. The discipline, as currently taught, has been characterized as deficient in purpose, scope, and style of teaching. The charge is that students are completing high school without the essential knowledge and intellectual skills to assume civic responsibilities or to develop personal competence--foreigners in their own culture (Hurd, 1986). Science educators now are beginning to realize that science in schools must be more broadly defined (Anderson, 1983) in terms of scientific literacy (Champagne and Klopfer, 1982) including technological, societal, and environmental dimensions (Bybee, 1985).

A number of environmental educators have signaled that many of the characteristics proposed in the new direction in science education already exist within environmental programs (see: Hart, 1986; Volk, 1984). It has been argued that there may be a certain disciplinary chauvinism which inhibits progress in science education through intentional ignorance of the legitimacy of ideas and practices outside the field as it is currently so narrowly defined (Lucas, 1980). It is clear that the newly emerging conceptual emphasis, (Roberts, 1982) for science education--science, technology, society (STS) education--subsumes a significant amount of the content which environmental education was initiated to purvey (Disinger, 1987). It has been argued that the inclusion of the term 'environment' in the STS title makes sense (Disinger, 1986; Lubbers, 1986) and it has already been included in the proposed conceptual framework for science education in one province in Canada (Hart, 1987).

Human Factor

It appears that many factors are acting to apply pressure that will result in changes to the sytem of formal education. The influence of valid ideas that build over time, the changes evident in the society which have historically been closely related to educational theory and practice, and changes in scientists' concepts of the nature and authenticity of what should occur in school science combine to act as a powerful force for educational change. However, agreement on goals and an emerging consensus of educational theory pertaining to science/technology/society/environment education will not be enough to move environmental education into mainstream North American education systems if the human factor is ignored. If we, in environmental education, fail to fully consider the teachers and students--that is, the notion of the interface between externalities such as goals and materials and the perceptions of people expected to implement and learn--then the question of whether the process should be integrated or segregated becomes meaningless from an implementation standpoint.

According to Hurd (1982), the most fundamental question one can ask about a profession is how it ethically perceives its purpose. In the case of environmental education, the issue at present is that we have paid considerable attention to our philosophical underpinnings from an environmental but not from an educational perspective. From a teacher's point of view, the second "E" in environmental education should be considered problematic. Environmental education, having achieved a relatively stable stage of maturity, must turn its attention to teachers, that is, to teacher education and professional development. Only by attending to existing gaps between our intentions (i.e., environmental goals) and our transactions (i.e., teacher perceptions, reaction to change and subsequent classroom action) in formal education will our ethical position as a profession become clear (see: Science Council of Canada, 1984).

Traditionally, teachers undergo a professional socialization and acculturation into the idealized norms of the teaching profession. In the case of secondary science teachers, entry into education often comes after an extended period of prior training and career orientation towards the sciences. During a subsequent period of teacher education, the individual develops a concept of career or occupation. Science teachers share a knowledge base with scientists--a knowledge base that is given high status in society and permits these teachers at least a psychological link to the scientific community. They also have a knowledge base in pedagogy which is somewhat ill-defined, probabilistic, lacks the precision of science, and is of lower status in society. Therefore, for many science teachers identification with science and its professional norms is preferable to identification with education, teaching, and students (Medvitz and Watson, 1979). This orientation has an effect on the teacher's perception of and response to communications from professional associations such as the North American Association for Environmental Education. In fact, science teachers have accepted science and scientists as their sources of authority. In so doing, they have failed to establish a necessary balance in their acceptance of expertise in science and in pedagogy. The resulting effect of this acculturation process has a tremendous impact on teacher attitudes toward change if it implies departure from standard or traditional practice.

Given the relatively low status of science education among the concerns of professional associations of science and the tenuous links of science teachers to the scientific community, it would seem appropriate that secondary teachers be encouraged to critically examine the differences in sociopolitical functioning between teachers of science and scientists. Teachers, generally, should take more responsibility for directing their own professional organization. For example, teachers should be encouraged to develop guidelines and requirements for teacher training. Thoughtful analysis and careful planning are required to create the conditions for teachers to take a more central role in curriculum planning.

In the case of elementary school teachers, allegiance to subject areas is much weaker, with the possible exception of language arts. Acceptance of environmental education goals, objectives and methods appears to be more palatable because pedagogical arguments are more meaningful to elementary teachers. Implementation-related issues of teacher support in the form of high quality materials and inservice become more important. The central problem, however, is teacher involvement. It is a problem because educational change has pedagogical and political dimensions. Our failure to recognize the importance of teacher participation in educational decision-making has resulted in a dismal record in past attempts to stimulate change.

I have recently been involved in a process of curriculum development that has involved teachers, large numbers of teachers, in all levels of policy making. In the past year, in the Province of Saskatchewan, teachers directly participated in the development of science education policy documents. The process involved teachers in a consideration of conceptual and organizational frameworks that should undergird the curriculum as well as the entire range of program elements that support the curriculum. The study method was a combination of deliberative inquiry (Science Council of Canada, 1984) and discrepant analysis (Harms, 1981). Teachers critically analyzed current practices and conditions, then constructed proposals and recommendations for renewal. The resulting policy directive, which included the concept of environmental literacy (see: Hungerford, Peyton, and Wilke, 1980), was the result of collaboration and participation (Hart, 1987).

Conclusion

Someone once said that there is nothing so powerful as an idea whose time has come. I believe that environmental education is an idea that is very close to achieving the critical mass needed to propel it to educational significance. The goal of environmental literacy is already a mainstream component within some educational jurisdictions.

The process of implementation remains problematical, given the associated teacher education and professional development issues raised in this paper. Change in teacher education is as much a political problem of perception involving value-laden conceptions of teaching and learning as a pedagogical problem of process.

Environmental education must direct its attention to teacher education and the professional development of practicing teachers. It must begin to clarify conflicting conceptions of how to change teachers. The process issue of whether to integrate or segregate will absolve itself in the larger process of resolution of conflicts surrounding the dimensions involved in the process of teacher change. And a key aspect of teacher change is teacher participation.

REFERENCES

Anderson, R. D. "Science: Its Period of Neglect Must End." NASSP Bulletin, 67(464), 63-67, 1983.

Beer, S. Platform for Change. New York: Wiley, 1975.

Bybee, R. W. "The Restoration of Confidence in Science and Technology Education." School Science and Mathematics, 85(2), 95-108, 1985.

Champagne, A. B., and L. E. Klopfer. "Actions in a Time of Crisis." Science Education, 66(4), 503-514, 1982.

Disinger, J. F. "Environmental Education Research News." The Environmentalist, 7(2), 85-89, 1987.

Disinger, J. F. "Current Trends in Environmental Education." Journal of Environmental Education, 17(2), 1-3, 1986.

Disinger, J. F. "Environmental Education Research News." The Environmentalist, 4, 247-252, 1984.

Eisner, E. B., and E. Vallance (eds). Conflicting Conceptions of Curriculum. Berkeley, CA: MuCutchan, 1974.

Goodlad, J. I. "Can Our Schools Get Better?" Phi Delta Kappan, 60, 342-347, 1979.

Harms, N. C., et al. What Research Says to the Science Teacher, Volume 3. Washington, DC: National Science Teachers Association, 1981. ED 205 367.

Hart, E. P. Science for Saskatchewan Schools: Field Study Report. Regina, SK: Saskatchewan Department of Education, 1987.

Hart, E. P. Science for Saskatchewan Schools: Proposed Directions--A Summary of Recent Literature, Analysis, and Recommendations. Regina, SK: Saskatchewan Department of Education, 1986.

Hungerford, H. R., R. B. Peyton, and R. J. Wilke. "Goals for Curriculum Development in Environmental Education." Journal of Environmental Education, 11(3), 42-47, 1980.

Hurd, P. D. "Perspectives for the Reform of Science Education." Phi Delta Kappan, 67(5), 353-358, 1986.

Hurd, P. D. "Transformation of Science Education: Challenges and Criteria." Science Education, 66(2), 281-285, 1982.

Lubbers, J. D. "Integrating Environmental Values in Science and Technology Education." In: Environmental Education: Progress toward a Sustainable Future, the Proceedings of the 14th Annual Conference of the North American Association for Environmental Education, J. Disinger and J. Opie (eds.), Troy, OH: NAEE, 1986. ED 281 761.

Lucas, A. M. "Science and Environmental Education: Pious Hopes, Self Praise, and Disciplinary Chauvinism." Studies in Science Education, 7, 1-26, 1980.

Medvitz, A. G. and F. G. Watson. "The Influence of Professional Associations on Science Teaching." In: Science Education/Society: A Guide to Interaction and Influence, 1979 AETS Yearbook, M. R. Abraham (ed). Columbus, OH: ERIC/SMEAC, 1979. ED 239 256.

Roberts, D. A. "Developing the Concept of 'Curriculum Emphases' in Science Education." Science Education, 66(2), 243-260, 1982.

Science Council of Canada. Science for Every Student: Educating Canadians for Tomorrow's World, Report 36. Ottawa, ON: Science Council of Canada, 1984. ED 247 095.

Shane, H. G. "America's Educational Future 1976-2001: The Views of 50 Distinguished World Citizens and Educators." The Futurist,10, 252-257, 1976.

Sterling, S. R. "Culture, Ethics, and the Environment--Toward the New Synthesis." The Environmentalist, 5(3), 197-206, 1985.

Volk, T. L. "Project Synthesis and Environmental Education." Science Education, 68(1), 23-33, 1984.

Environmental Education and Student Behaviors*

Harold R. Hungerford

A Preface

What follows is a reprinting of an introduction to a monograph paper prepared by Trudi L. Volk and myself for Volume I of NAEE's Monographs in Environmental Education and Environmental Studies. It serves as a fictionalized account of a student's educational experiences which led him/her to become a responsible and dedicated environmentalist in the truest sense of the word. It also serves as an advance organizer for this paper.

> *My education in the elementary and high schools provided me with an intense environmental commitment. By this I mean I am committed to living my life in a manner that helps solve environmental issues instead of creating them. Although I don't recall the exact sequence of events that led to this resolve on my part, I can tell you some of the things that weighed heavily on this decision.*
>
> *Perhaps the most important thing I got out of school was a sense of moral responsibility, as a citizen, toward the environment. I don't mean morality in the traditional sense, that is, focusing on man's relationship with man. I'm talking more about a morality which also considers man's relationships with the environment and which acknowledges the survival rights of other species--in essence, an attitude which respects the integrity of living systems in the environment. I know that this philosophy isn't necessarily man-centered, but it sure*

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*This paper is somewhat of a synthesis of works already in preparation, in press, or already printed. Wanting to avoid undue criticism for "lifting material" already available, I acknowledge both the lack of originality in this paper and the fine professionals who have contributed, in one way or another, to the ideas expressed here. These would include, but not be limited to, Ben Peyton, Rick Wilke, Trudi Volk, John Ramsey, Gary Klingler, Gary Harvey, Archie Sia, Jody Hines Stone, Tom Marcinkowski, and the late Audrey Tomera.

The reader will be quick to note that numerous writings and research studies are not cited. This is purposeful. It has been done in order to maintain a quasi-informal approach. However, the reader is invited to refer to the bibliography for the sources of information presented here.

does mean a lot for man over the long haul. I feel as though there can be no real quality of life for me or my children unless there is a concomitant quality of the environment. Maybe it's a matter of the way in which quality of life and quality of the environment are intertwined. In any event, much of my moral posturing focuses on the way in which the human race interrelates with nature rather than on man-man relationships alone.

Of course, as a participating citizen, I needed a firm foundation in citizenship action skills. These I started to get way back in the elementary school. And, I got more and more sophisticated with them as I progressed through the secondary school. Interestingly enough, I was never forced to apply them in social issue settings but, like most of my classmates, I eventually got involved in one way or another. Knowing what could be done and having practiced the skills in a school setting did a lot to bring about confidence in one's ability to effect change. Gosh, when I think about some of the stuff we got involved with, it makes me feel like we were all participating citizens and not just spectators on the sidelines. And, most of us are still involved in some form of environmental activism.

As I look back over my K-12 schooling I am convinced that my teachers, by and large, were themselves committed to environmental integrity. Some in particular acted as super role models for us. I'm certain that these teachers helped us become increasingly sensitive to the environment and concerned for the environment. What did they do as role models? Well, first and foremost, they lived an environmental ethic. Most were not radicals in the strictest sense of the term but you knew that they thought about their personal life styles in an environmental context. And, they were willing to talk to us about their perspectives. This helped a great deal. In addition, they would suggest books to read and places to go and things to do, all of which led to an increased environmental sensitivity. Heck, some of 'em even planned weekend outings or summer programs for us. We were never close to any nature centers or places like that so we had to get it all through our schooling or with our families. Unfortunately, not many kids had parents that thought too much about environmental concerns.

What else? Let's see. Oh yes, much of our instruction was issue-oriented. It was kind of like we were constantly probing environmentally-related social issues. Sometimes we would work on these as case studies and look at the problems from all possible angles. We searched for alternative positions being held on issues, the values associated with these *positions, and what the alternative solutions were for these issues. When we evaluated the possible solutions we always looked at the social, economic, and political consequences. And, of course, we never took our eyes off the ecological consequences of the alternatives. That has to be the bottom line when we are looking for solutions, doesn't it?*

Sometimes, instead of looking at specific issues as case studies, we were given the opportunity to choose issues of particular concern to us as individuals and investigate these ourselves or in small groups. That was particularly interesting and worthwhile because not all of us were interested in the same things. I never could get worked up about the preservation of wild horses or burros and yet there were kids in our class who really got excited about their management. What the teachers called autonomous investigation gave every student an opportunity to look at issues of concern to him or her in real depth. The ringer here, however, is that we had to be taught the investigation skills first. Easier said than done. But, in the end, we all profited immensely from this training because we also applied some of these same skills in other classes. We were pretty good at getting information from agencies, finding sources in the library, writing questionnaires, interpreting data and the like. It sure made life in college a whole lot easier too.

Anyway, it's hard to point to one thing and one alone and say that it is responsible for what I am environmentally today. All of the things I have talked about here were important. In the final analysis though, it is probably a matter of perspective...a point of view, if you will. I firmly believe that I am responsible, rather, that each of us is responsible, for the maintenance of an equilibrium with the environment. I guess you might call that an ethic of biospheric integrity. But alone, that ethic or point of view is not enough. You have to learn what to do with that ethic! These are the things I learned in elementary and secondary schools. These things probably made me what I am today!

Where Does It Fit?

Interestingly enough, the student in the above anecdote gives us little information about how the curriculum in his/her school was organized except that we can infer that environmental education was, somehow, pervasive throughout the grades. The question of where and how environmental education fits into the school's curriculum may well be a moot issue. It appears critical, however, to make certain that desired changes in student behavior (educational outcomes) are taught and reinforced throughout the years. This can probably be accomplished by infusing environmental content into existing courses or by a combination of infusion with a single subject approach. The writer simply does not care how it is accomplished as long as there exists pervasive attention to the necessary knowledge and skills associated with strategies needed to change human behavior in appropriate directions. There is little research to support a particular "style" of curricular organization for environmental education, but there is some research to indicate that there needs to be at least a modicum of reinforcement if appropriate behaviors are to be taught and retained over the long haul.

Thus, if we are truly interested in changing human behavior, it appears crucial to make certain that: (1) desired behaviors are taught, and (2) that those same behaviors are reinforced throughout a student's schooling. Again, the exact mode of organization for an environmentally-related curriculum may not be the question as long as that organization accommodates the knowledge, skills, and reinforcement necessary to guarantee responsible citizenship in the adult community.

What Are Those Behaviors?

Over the years, the writer and his associates have had the pleasure of experiencing a number of satisfying successes in the search for strategies for changing student behavior. Most of these victories have come at the middle school level because it is in the middle school where "time" seems to be available and teachers are willing to try something which appears to be radically different. It is also here that the students are maturing enough to be able to think about abstractions and form skills and concepts so very important to those behaviors needed in adult life. This is not to say that environmentally-related topics cannot be taught below the middle school level or above it. Indeed they can. However, in the years above the middle school, we find it extremely difficult to convince instructors that citizenship goals are imperative, particularly when most high school content specialists have a strong psychological need to impart knowledge in the classroom.

Given that most readers are probably sick and tired of reading literature that reiterates the goals for curriculum development in environmental education (Hungerford, et al., 1980), let me but briefly summarize those goals here. This curricular theory calls for a hierarchical treatment of content/skills which are designed to change behavior in a prescribed direction. In addition to certain foundational components, these goals are:

I. Ecological Concepts: This goal level attempts to provide the learner with the ecological knowledge that will permit him/her to make ecologically sound decisions with respect to environmental issues. This knowledge would include (but not be limited to) such concepts as individuals and populations, interaction, limiting factors, biogeochemical cycling, abiotic influences, homeostasis, succession, etc.

II. Conceptual Awareness: This goal level attempts to develop a conceptual awareness (i.e., knowledge) of how individual and collective behaviors influence the relationship between quality of life and quality of the environment, as well as how human behaviors result in issues which must be resolved through investigation, evaluation, decision-making, and citizenship action.

III. Issue Investigation and Evaluation: This goal level attempts to develop the knowledge and skills needed to permit learners to investigate environmental issues and evaluate alternative solutions for remediating these issues. It also provides opportunities for students to actually investigate and evaluate issues.

IV. Environmental Action Skills: Training and Application: This goal level attempts to develop those skills needed for learners to take positive environmental action for the purpose of resolving or helping resolve environmentally-related issues. It also involves the development of action plans by the students and provides them with the opportunity to implement those plans if they so desire.

Even though the discrete behaviors for each of the above goal levels are not listed in this document, many of them should be easily inferred. Of particular importance for the reader is to realize that Goals I and II are basically knowledge goals with few skills involved. On the other hand, Goals III and IV are basically skill-oriented and demand both training in and application of the skills. Herein lies a major problem in environmental education. The majority of environmental programs rely on Goal Levels I and II to change behavior and fail to recognize the need for Goal Levels III and IV. And, research indicates strongly that behavior will not change if students are exposed only to Goals I and II. It also indicates strongly that behavior will change if students are thoroughly exposed to Goals III and IV in addition to I and II.

In summary, the behaviors that must be taught to young citizens, if behavioral change is desired, include issue investigation and evaluation as well as citizenship action. Any attempt to avoid in-depth instruction in these skills appears to result in little, if any, behavioral change in desired directions.

What Are the Teachers' Options?

It appears rather obvious that, if we are going to change student behaviors in a direction focused on citizenship behavior, we must deal with environmentally-related issues and their solutions. "Solution," of course, infers the need for citizenship action skills which can be used to remediate or help remediate these issues. And, for those readers who would argue the need for ecologically-sound life styling, I would insist that a person's life style is no more than an application of one or more of the action skills proposed in the options discussed in this section.

Two options have proven themselves suitable for the teaching of the skills necessary to develop responsible citizenship behavior. With both of these options there are advantages and disadvantages. I will discuss these options from a middle school perspective, realizing full well that the lower level knowledge and skills are perfectly adaptable to grades lower than the middle school.

Option I: The Case Study Approach. The issue case study is, by and large, a teacher directed analysis of a single environmental issue, e.g., the management of the giant Canada goose in Illinois, acid rain controversies, non-point pollution from the use of agricultural chemicals, etc. It is an instructional method which utilizes both primary and secondary sources of information to deliver issue-focused information and skills to students.

Typically, original sources of information (including community resources) are initially used by the teacher to develop a foundation of knowledge concerning the issue. Subsequently, the teacher will provide the students with the skills needed to investigate that issue on a class or a small-group basis. This could well lead to instruction on the development of survey instruments and the development of either a questionnaire or opinionnaire that the class could use within the community or region. This would lead to the collection of primary data which would be recorded and interpreted by the entire class. Using these data and the other information learned about the issue, students can decide what should be done about this issue. The time is then ripe for citizenship action training and the eventual development of an action plan which may or may not be implemented, depending upon the decisions made cooperatively by the teacher and students.

The case study puts the teacher in direct control of instruction and the learning process. Thus, the teacher has the flexibility and the control over the issue investigation. The teacher can choose the issue, determine the resources and methods used, make decisions concerning the depth in which the issue will be studied, and determine the length of time to be spent on the case study.

There is a price that must be paid, however, for flexibility and control. The costs involve time, energy, and skill in putting the case study together. They also involve a responsibility for finding and selecting original sources, be they video tapes, printed matter, guest speakers, panel members, films, field trips, or simulations. Handouts must be prepared. Etc. The development of an effective case study is not an easy task!

There is another, perhaps more important, price to be paid by using the case study. Even if the citizenship action training is incorporated into the case study format, citizenship action may be observed on the part of the students but this action will probably be limited to the issue involved in the case study. In other words, case studies, because of their narrow focus, will probably not foster generalizeable citizenship behavior. This is a cost that we can ill-afford to make if we are interested in promoting responsible citizenship behavior as a life-long pursuit.

Option II: The Investigation Skill Format. The investigation skill format employs a broader, more generalizeable approach to the process of issue investigation. The intent of the investigation methodology is to develop in students the capabilities (skills) involved in issue investigation and resolution. Hopefully, these are capabilities that can be used throughout students' lives as participating citizens in their communities, regions, and nations.

Like the case study approach, the investigation skill method utilizes instructional activities structured around the four issue investigation goal levels. However, unlike the case study approach, the investigation skill method defines, practices, and applies the generic knowledge and skills needed by learners to independently investigate and resolve issues. This procedure culminates in an investigation of an issue of the student's own choosing and the development of an action plan for resolving that issue. A very potent multiplier component is evident as students report back on their investigations and evaluations to their peers. In this manner, all students are made aware of a wide variety of issues and recommendations for their solution or partial solution. It is absolutely amazing how expert students can become with respect to the issues they have investigated. I have been awed by how much more middle school students know about particular issues than I do. It is very satisfying although somewhat frustrating to sit there and realize that the kids know more than I do!

How would one lay out an investigative skill approach? The one that we have developed involves the following components:

1. An Introduction to Issue Investigation. In the initial phase, students learn to discriminate between events, problems and issues. The impact of beliefs and values on issues is explored. Students analyze issues to determine the major question(s) involved as well as the "players," their beliefs, and the accompanying values. The concept of "interaction" is also introduced, demonstrated, and applied.

2. The Basics of Issue Investigation. Students identify issues, learn to write research questions, and learn how to obtain information from secondary sources as well as to compare and evaluate those information sources.

3. Using Surveys, Questionnaires, and Opinionnaires. Students learn how to obtain information using primary methods of investigation. Initially, they learn how to develop surveys, questionnaires, and opinionnaires. Subsequently, they learn sampling techniques and how to administer data collection instruments as well as how to record these data.

4. Interpreting Data. Students learn how to draw conclusions from data, make inferences based on data, and formulate recommendations. They also learn strategies for recording data for accurate communication of those data.

5. Investigating an Issue. Students independently select and investigate an issue. This process involves the application and synthesis of the skills learned thus far.

6. Issue Resolution Training. Students learn the major methods of citizenship action (less legal action strategies), analyze the effectiveness of individual versus group action, and develop issue resolution action plans. This "action plan" is evaluated against a set of predetermined criteria designed to assess the social, cultural and ecological implications of citizenship actions. Finally, the action plan may be carried out at the discretion of the student--in an autonomous mode.

What are the limitations to this approach? Teachers find that it takes a minimum of an eighteen-week semester to complete this instructional strategy. Also, teachers find that they need to apply a variety of classroom management skills, some of which are somewhat unfamiliar to many of them. Some teachers become very uneasy when it becomes time to act as a facilitator between resources and students as the students investigate an array of issues. In particular, some teachers have found that it is difficult to make the transition from direct instruction to a role which demands helping students access data sources as well as advising and consulting (during the independent issue investigation phase).

How Do the Two Approaches Compare?

Both the case study and the investigation skill approaches provide instructional methods for environmental educators (teachers) to effectively deal with issue instruction. Both strategies share similar instructional goals and activities, but they differ significantly in scope, teacher and student postures, instructional time demands, and a variety of other curricular and classroom management factors. The chart which follows (Table 1) compares the case study and investigation skill approaches across a number of variables.

Table 1. THE COMPARISON*

CHARACTERISTIC	CASE STUDY	ISSUE INVESTIGATION
Characteristic of Students:		
1. Grade Level	4 - 12	6 - 12
2. Student Role	As a Receiver and a Large Group Researcher	Autonomous (Independent) Researcher
3. Ability Levels	A Wide Range of Students	Typically Average and Above
4. Student's sense of "Issue Ownership"	Not Necessarily	Typically, yes
Characteristics of Instruction:		
1. Issue Focus	Single Issue Treatment; Issues Usually Chosen by the Instructor	Multiple Issue Treatment; Issues Definitely Chosen by the Students
2. Instructor's Posture	Initially, Traditional; A Facilitator/ Consultant During Class Investigation	Direct Instruction Followed by Role as Investigation and Action Facilitator
3. Demand for Instructor Flexibility Compared With Traditional Methods	Moderate	High
4. Risk of an Instructional Syntax Problem	High	Low
5. Need for Inservice Education	High	Very High
6. Potential for Infusion Into Existing Programs	Very High	Low to Moderate, Requires a Separate Block of Time

(continued on next page)

Table 1 (continued from page 33)

CHARACTERISTIC	CASE STUDY	ISSUE INVESTIGATION
7. Potential for Team Teaching	Moderate	Very High
8. Time Demands	Variable; A Great Deal Depends Upon the Case Study, Depth of Instruction, and Teacher Commitment	12 - 18 Weeks Minimum
Outcomes of Instruction:		
1. Knowledge of a Broad Range of Issues	Low	High
2. Process (Skill) Acquisition	Low - Moderate	Very High
3. Extent of Citizenship Action Skill Acquisition	Typically Issue-Specific	Generic, Having Significant Transfer Potential
4. Citizenship Behavior (Out-of-School Actions)	Moderate if all Components are Covered	High
Materials:		
1. Source	Teacher-Constructed Except for Issue Literature/Films/Local Resources, Etc.	A Published Program is Available*; Teacher Can Develop Own Program if Time and Skill Permit
2. Expense	Relatively Low; Depends Largely on the Issue	$7 - $8 Per Student

*Hungerford, et al. Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules. Champaign, Illinois: Stipes Publishing Company, 1985.

Some Thoughts on Grade Levels and Curricular Strategies

As noted earlier, the question is not so much where to put issue investigaton as it is how to get the job done! Again, the instruction needed to change behavior must be goal-oriented and it must be as pervasive as possible in a student's education. Even so, the reader may be wondering where to infuse issue investigation into the curriculum of the school. Some thoughts on this topic may prove helpful.

First and foremost, we know that issue instruction can begin in kindergarten. A number of years ago a very fine kindergarten teacher in Carbondale, Illinois, Covey Bryant, successfully demonstrated that kindergarten children could: (1) understand what was meant by the term "environment," (2) conceptualize problems associated with solid waste management, air pollution, and noise pollution, and (3) conceptualize their own limits for solving these problems while communicating things that adults could and should be doing with respect to these problems. Issues, per se, were not considered here. The topics were dealt with as problems and the more difficult concept of "issue" was not introduced. Be that as it may, Bryant's study should have served as a landmark investigation with respect to the tremendous potential for starting issue instruction early and vigorously.

Subsequent to Covey Bryant's contribution, the writer, in consort with other professionals from SIU-C and Murray State University, and with the help of the National Science Foundation, has trained approximately 100 elementary and middle school teachers in both of the approaches discussed above. These teachers have represented grade levels ranging from second to ninth. In all cases, where teachers have been responsive to issue instruction, the implementation of said instruction in their classrooms has been successful. Needless to say, second graders are not as able to become involved in in-depth issue investigation and citizenship action strategies as are middle school students. Nor are second graders able to handle the more sophisticated investigation skill development format. However, numerous case studies have been and are being developed for the early elementary student which will, hopefully, dovetail with independent issue investigation at higher grade levels. We feel rather strongly that students must be exposed to a number of case studies as well as the issue investigation skills in order to internalize the concepts and skills needed for responsible citizenship. Or, if training begins in the middle school level with issue investigation skill training, there must be some later reinforcement of issue instruction so that the citizenship behaviors do not erode prior to adulthood.

Later reinforcement at the senior high school level could well take one of several forms. One possibility is to infuse more sophisticated case studies into the sciences and the social studies. Numerous courses are very appropriate for this, e.g., earth science, biology, chemistry, home economics, agriculture, health, civics, social problems. Case studies offer the possibility of getting at issue investigation and citizenship responsibility without dramatically changing/altering existing content. In fact, most case studies appropriate for these courses fit easily into existing content, e.g., food additive issues in home economics, toxic waste disposal issues in health, land use management issues in agriculture and biology, the ozone issue in earth science, etc., etc.! The case study infusion strategy may well be the most pragmatic one available. Of course, we would like to see a new course developed, one which would integrate issue investigation from the sciences and citizenship from the social studies and bring to bear the skills needed to meet the ultimate challenge of environmental education...the development of environmentally literate and socially responsible human beings.

Is there any evidence to support the claim that issue infusion is an educationally sound approach, regardless of grade level? If one does a thorough analysis of the objectives involved in issue instruction, it becomes clear that those objectives are not content-specific. Some fall nicely into the science area, some into language arts, and many into the social studies. An analysis of the skill development program cited earlier revealed that the objectives for the various modules could be distributed approximately as follows: Science = 30%; Language Arts = 30%; Social Studies = 40%. Therefore, it appears rather obvious that issue instruction can be infused into one or more of these content areas, although it is probably more a creature of science and the social sciences than language arts. Thus, it seems incumbent on professional educators to become skilled with the goals and objectives of issue instruction and to determine the best way to infuse this kind of instruction in given situations.

In Closing

The bias of this paper certainly rests with the "what we are doing" rather than "where we are doing it," although there are certainly strong arguments that could be posed for a pervasive infusion (throughout elementary and secondary schools) of issue instruction with concomitant citizenship action skill training. Nevertheless, if we are interested in changing student behavior in an educational sense, we must attend to our goals initially and our curricular strategies secondarily. This document has addressed both of these topics, hopefully in a helpful manner.

REFERENCES

Bryant, C. K., and H. R. Hungerford. "An Analysis of Strategies for Teaching Environmental Concepts and Values Clarification in Kindergarten." Journal of Environmental Education, 9(1), 44-49, 1977.

Childress, R. B. "Public School Environmental Education Curricula: A National Profile." Journal of Environmental Education, 9(3), 2-10, 1978.

Hines, J. M., H. R. Hungerford, and A. N. Tomera. "Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis." Journal of Environmental Education, 18(2), 1-8, 1986/7.

Hungerford, H. R., R. A. Litherland, R. B. Peyton, J. M. Ramsey, A. N. Tomera, and T. L. Volk. Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules. Champaign, IL: Stipes, 1985. ED 257 664.

Hungerford, H. R., and R. B. Peyton. Procedures for Developing an Environmental Education Curriculum (Environmental Education Series, No. 22). Paris: UNESCO-UNEP Environmental Education Programme, 1986. ED 277 569.

Hungerford, H. R., R. B. Peyton, and R. Wilke. "Goals for Curriculum Development for Environmental Education." Journal of Environmental Education, 11(3), 42-47, 1980.

Klingler, G. "The Effect of an Instructional Sequence on the Environmental Action Skills of a Sample of Southern Illinois Eighth Graders." Unpublished Master's Research, Southern Illinois University at Carbondale, 1980.

Peyton, R. B., and H. R. Hungerford. "An Assessment of Teachers' Abilities to Identify, Teach, and Implement Environmental Action Skills." In: Current Issues VI: The Yearbook of Environmental Education and Environmental Studies, A. B. Sacks, L. L. Burrus-Bammel, C. B. Davis, and L. A. Iozzi (eds.), Columbus, OH: ERIC/SMEAC, 1980. ED 197 947.

Ramsey, J. "A Followup Investigation of the Erosion of Environmental Behaviors Three Years after Treatment." Unpublished institutional research, Southern Illinois University-Carbondale, 1984.

Ramsey, J., H. R. Hungerford, and A. N. Tomera. "Effects of Environmental Action and Environmental Case Study Instruction on the Overt Environmental Behavior of Eighth Grade Students." Journal of Environmental Education, 13(1), 24-29, 1981.

Sia, A. P., H. R. Hungerford, and A. N. Tomera. "A National Survey of Curriculum Needs as Perceived by Professional Environmental Educators." Journal of Environmental Education, 16(1), 10-19, 1984.

Volk, T. L. "Project Synthesis and Environmental Education." Science Education, 68(1), 23-34, 1984.

Environmental Education in the School Curriculum: The Research Base

Louis A. Iozzi

The charge to the presentors participating in this symposium was to address the question: "Environmental Education in the School Curriculum: (How) Does It Fit?" More specifically, should environmental considerations be integrated into existing curricula as they may fit, or should environmental education be approached as a separate subject? Of course, as the moderator of this session pointed out in the symposium description, there are also many intermediate positions or ways of resolving the problem.

At the outset, I think it is important for me to make clear some assumptions under which I am operating. First, whether environmental education is included in the curriculum as a separate subject or if it is integrated and taught as part of another subject normally found in the schools, I am assuming that it will be taught in an interdisciplinary manner. I also make the assumption that in using either approach, ecological, scientific, aesthetic, values, and other important dimensions of environmental problem-solving and decision-making will be dealt with in an integrated manner. If these assumptions are denied, then in my judgment we are not talking about environmental education and in that case, there is little for me to talk about. Without these "essentials," we would then be talking about teaching "ecology" (a specialized branch of science), or nature study, or acclimatization, or whatever. While these, and so many other topics or areas of inquiry that are included as part of environmental education, might be very useful and perhaps even valuable pursuits, any of them alone is not, in my judgment, environmental education. Hence, I approach this problem not as two strategies for dealing with differences in content or even significant differences in teaching methodology, but rather as seeking to determine which of two different delivery systems presenting similar content--environmental education--might be more effective for teaching environmental education in the total school curriculum.

Frequently, the research literature of an area of inquiry provides clues, at least, to help one make valid decisions when dealing with complex choices or issues. As chairman of the North American Commission for Environmental Education Research (NACEER), I have had a magnificent opportunity to work with some of the most talented environmental education researchers in North America. We have invested many hours in studying and analyzing the large volume of research that has been generated in this area over a time span covering more than a decade and a half. Unfortunately, that body of literature sheds very little light on our symposium question. Some studies showed that an infusion model worked best with some children while other studies showed positive results using a "separate subject" approach. Of course, those who are familiar with the body of environmental education research to which I refer realize that many of the early studies were unfortunately flawed in several ways. Experimental designs, procedures, instrument reliability and validity, and several other important research criteria were not always carefully considered, particularly in those studies conducted during the earlier part of this time period. However, even in the most rigorous studies conducted, the astute observer would see that the results achieved could, in reality, easily have been attributed to the skills and enthusiasm of specific teachers and teaching styles as much as to the curriculum or to how the environmental education program was included in the overall school program of instruction.

If the content and/or teaching approaches do not differ appreciably, and if the research base provides no conclusive evidence as to which method is better at inducing positive growth in cognition and in affect as related to the environment, then which method do I consider the better of two?

Clearly, few things in education--or anywhere else, for that matter--can be reduced simply to a choice between two disparate possibilities. That alone should be enough to convince even the most casual observer that a "middle-of-the-road" position would be the "best" way to resolve the issue. At least, it would be the "politically safe" way to decide. However, I believe that I am compelled to choose more of a "middle-ground" approach for what appear to me, at least, to be much more valid reasons. Surely, I can see great value in teaching environmental education at a designated time every day. On the other hand, I can also see situations in which I would be very much opposed to such an approach on theoretical, philosophical, and on practical grounds as well.

First, let me state that I believe that environmental topics and issues should permeate the curriculum at appropriate places in all subjects and at all grade levels from kindergarten through college. I believe, moreover, that environmental education should be formally structured and infused into the existing total curriculum of the school and not be left simply to chance or to individual "teacher choice." Rather, environmental concepts appropriate to the discipline must be actually written into the curriculum to ensure that over the course of the child's schooling, he or she receives a full environmental education.

That is only step 1, however. I also see a need, particularly at the senior high school level, for separate courses in environmental education. These can be courses that deal with a broad array of environmental problems/issues--or individual courses, each concerned primarily with a separate topic. Preferably, schools would offer both. Such an approach is particularly appropriate at the college level. I must emphasize that these "separate" course offerings would be IN ADDITION to, and AFTER the student has been exposed to several years of environmental education infused and taught in an interdisciplinary, integrated, and wholistic manner.

In fact, at Cook College, Rutgers University, all freshmen are required to take a course called Introduction to Environmental Sciences and Agriculture. Moreover, all students are also required to take at least two additional environment-related courses by the time they graduate. It should be stressed again that this is a requirement for all students, no matter what their major.

Ideally, the approach that I have just outlined ensures that all students would, through an infusion approach, receive a reasonably strong and wholistic background in environmental concepts, and issues --the kind of background and training that all citizens will need to function intelligently and productively as we move into the 21st Century. This strategy, moreover, provides additional opportunities for students interested in learning more about environmental problems and topics to enroll in separate courses at both the senior high school and college levels.

As an aside, it might be interesting to note that John Dewey in 1916, I believe, proposed a core curriculum for the elementary school in which the environment would be the core topic of one unit of study. In Dewey's approach, everything that the student was to do during the unit would relate in some meaningful way to the environment. Stories read would deal with environmental themes, arithmetic would be taught using real environmental topics, social studies would focus on environment-related issues, and of course, so too would science, music, art, and so on.

From my discussion thus far it should be clear that while I suggest that both approaches can be useful, I am not really taking very much of a "middle-of-the-road" position either. I am basically arguing for an infusion mode for most of the student's environmental education and then making available for those interested in going beyond the environmental "basics" separate, and more in-depth courses. If we view the problem as a line that stretched from New York City to Los Angeles, I would probably find myself somewhere around Columbus, Ohio.

As Muir once remarked, "when we try to pick out anything by itself we find it hitched to everything else in the universe," and as I have written elsewhere, "just as everything in the universe is integrated and connected to everything else, so too must a child's environmental education be integrated with and connected to the total curriculum." In my judgment, to teach environmental topics and issues to all children as a separate and distinct subject would give a fragmented, one-sided, incomplete, and distorted perspective of what "environment" and environmental problems are really all about. In fact, it is precisely this type of fragmented, disjointed, "one-sided" (or is it short-sighted--or both?) type of decision-making that for the most part got us into environmental trouble to begin with.

To be both meaningful and for students to begin to understand and appreciate the essence of environmental problem-solving, environmental education must be aproached wholistically. This, in turn, clearly suggests that an infusion model would be most appropriate for providing a basic environmental education for all students.

In recent years, a few well-meaning individuals have argued that environmental education "has gone astray" and that it should be a "separate," "focused," "sequential," "K-12" course. I submit that--even ignoring the philosophical "wholistic" point of view that I mentioned earlier--using a separate course approach as the dominant mode for teaching environmental education in our schools would be doomed to failure. At best, such an approach would lead to what I would call "Friday afternoon environmental education." That is, environmental education taught if and when there is time.

Knowing full well that the demand for time in our schools already exceeds the amount of time available, how much environmental education do you think would be taught if a separate course of study were to be introduced in grades K-12? We need only look to science education in the elementary school to see how a separate environmental education course might fare if it was introduced as a "sequential," "separate," program of study. Science education was formally included in the school curriculum at about 1850. Today, nearly a century and a half later, science education in the elementary school can be best described as "Friday afternoon science." In New Jersey, some school districts are even attempting to combine science with the math curriculum in an effort to get more science taught in the elementary school. The logic behind such an approach is that since mathematics is always taught routinely and regularly in the elementary school, by tagging science onto the math program it is possible that more science might be automatically taught in the elementary grades.

The American Association for the Advancement of Science (AAAS) has noted that most elementary school students are "turned off" to science by the second or third grade. I fear that if environmental education is forced to follow a route similar to that of science education--a separate course--the same thing will happen to environmental education as well. That is, it would be taught in a fragmented, superficial, and uninteresting manner. Despite living in a highly scientific and technological world, and despite nearly 150 years in the curriculum, science education is rarely--if ever--taught on a regular, "sequential," "K-12," basis. As a point of interest, can anyone name any subject that in any school system is taught "sequentially, grades K-12?" I can't!

I will be the first to admit that trying to get the type of program I have just described into our schools will not be easy. We have, however, many scholars who have written on and have been very successful in providing guidance for developing such programs. It can be done--they have done it in the past and we can do it in the future.

It should be recognized that some school districts--far too many, unfortunately--would not be willing to use any environmental education program if they had to include the type of program I have suggested or if they had to add a separate course to the already overcrowded curricula. They simply do not recognize, or refuse to recognize, a need for such a program. What about them?

Some of the most flexible, yet useful and effective programs I know of are Project Learning Tree, Project Wild, the CLASS Project, and several others. Unfortunately, these programs have been the focus of attack by those who argue that environmental education "has gone astray." Admittedly these programs are far from the kind of program I have proposed in this paper. However, I have found them to be widely used, useful, and by and large quite effective when used by skillful teachers. Moreover, they are readily available to most teachers who want to use them.

Perhaps I am taking the easy way out, but when I am hungry and a full loaf of bread is not available, a half loaf of bread looks pretty good. My feeling is, if such programs get some environmental education to our youth, it is at least a start in the right direction. In some districts with which I am familiar, it might be the only type of program that the local school officials will allow in the schools. While I recognize the need to encourage the implementation of "full" and "complete" environmental education programs at all levels, I am also not so naive as to think that such success is likely to be achieved. In those cases as well as in many others, I can see Project Learning Tree, Project WILD, and so many other programs playing an important role in our efforts to promote environmental literacy and environmental quality.

REFERENCES

Iozzi, Louis A. (ed). Research in Environmental Education, 1971-1980. The First Report of the National Commission on Environmental Education Research. Columbus, OH: ERIC/SMEAC, 1981. ED 214 762.

Iozzi, Louis A. (ed). A Summary of Research in Environmental Education, 1971-1982. The Second Report of the National Commission on Environmental Education Research. NAEE Monograph #2. Columbus, OH: ERIC/SMEAC, 1984. ED 259 879.

National Wildlife Federation. The CLASS Project. Washington, DC: NWF, 1982.

Western Regional Environmental Education Council. Project Learning Tree (two vols). Washington, DC: American Forest Institute, 1977.

Western Regional Environmental Education Council. Project WILD (2 vols). Boulder, CO; Project WILD, 1983.

Environmental Education in the Curriculum: It's Already There!

David C. Engleson

Revisions in curriculum and other aspects of education have been called for by numerous authorities in recent years. Mortimer Adler's The Paideia Proposal: An Educational Manifesto was published in 1982 and shortly thereafter, the National Commission on Excellence in Education produced A Nation At Risk: The Imperative for Educational Reform. These were followed with statements by the College Board, Ernest Boyer, John Goodlad, Theodore Sizer, and others. And then came the last one, hopefully--A Nation Prepared: Teachers for the Twenty-First Century, prepared by the Task Force on Teaching as a Profession of the Carnegie Forum on Education and the Economy. It refers to all the others when it states in its "Executive Summary:"

> *In the past three years, the American people have made a good beginning in the search for an educational renaissance. They have pointed to educational weaknesses to be corrected; they have outlined ways to recapture a commitment to quality...*
>
> *In this new pursuit of excellence, however, Americans (and I believe most educators) have not yet fully recognized two essential truths: first, that success depends on achieving far more demanding educational standards then we have ever attempted before, and second, that the key to success lies in creating a profession equal to the task--a profession of well-educated teachers prepared to assume new powers and responsibilities to redesign schools for the future. Without a profession possessed of high skills, capabilities and aspirations, any reforms will be short-lived.*

Let us not forget that latter point in our eagerness to answer the question which this symposium addresses. Teacher preparation is at least as important as curriculum and needs to be addressed. Perhaps it is a topic for a symposium at our 1988 conference.

But what are the "demanding educational standards" that the "Executive Summary" refers to? In my examination of the recent pronouncements on education I find three curriculum-related goals common to most of them. They are: (1) the cultivation of responsible citizenship; (2) the promotion of a positive obligation of community service; and (3) the promotion of a philosophy of global interdependence. Similar statements are familiar to all of us; they have been made frequently before. But when you read the rest of the discussions regarding them, I think you will discover that these recent statements indeed do strive for a higher level of attainment than we have ever suggested before.

Before proceeding further, I think it might be wise to share with you my concept of what environmental education should be like in grades kindergarten through twelve. That concept, expressed in

A Guide to Curriculum Planning in Environmental Education published by the Wisconsin Department of Public Instruction, reflects the Tbilisi Declaration as it pertains to elementary and secondary education. The five objective categories utilized are:

> Awareness: Helping students to develop the ability to perceive and discriminate among stimuli; process, refine, and extend these perceptions; use this new ability in a variety of contexts; and thus develop an awareness and sensitivity to the total environment and its problems.
>
> Knowledge: Helping students to acquire a basic understanding of how the environment functions; how people interact with the environment; and how environmental issues and problems arise and how they can be resolved.
>
> Attitudes: Helping students to develop positive environmental attitudes and subsequently positive environmental values and a positive environmental ethic with the motivation and commitment to participate in environmental maintenance and improvement.
>
> Skills: Helping students to acquire the skills needed to identify, investigate and contribute to the resolution of environmental issues and problems.
>
> Participation: Helping students acquire experience in using their acquired knowledge and skills in taking thoughtful, positive action toward the resolution of environmental issues and problems.

Although it may be desirable to teach for the attainment of objectives from all five categories at each grade level, because of the changing intellectual and moral developmental characteristics of children, some kinds of objectives should be emphasized more than others at certain levels (Table 1).

TABLE 1

Grade-Level Emphases on Environmental Education Objective Categories

Level	Major Emphasis	Minor Emphasis
K-3	Awareness, Attitudes	Knowledge, Skills, Participation
3-6	Knowledge, Attitudes	Awareness, Skills, Participation
6-9	Knowledge, Skills, Attitudes	Awareness, Participation
9-12	Skills, Participation, Attitudes	Awareness, Knowledge

With that explanation, it is possible to relate some of the goals recommended in the recent statements on educational reform to my description of environmental education. Both deal with preparing responsible citizens, qualified and committed to become involved in their communities, whether they be local, state- or province-wide, nation-wide, or global in extent. And both promote a philosophy of global interdependence.

In recent years, Wisconsin educators have completed a series of curriculum planning guides based on the latest thinking and research which I believe reflect "far more demanding educational standards than we have ever attempted before." Wisconsin has a school district standard requiring sequential plans in all curriculum areas, with the incorporation of environmental education objectives into all plans, with the greatest emphasis in the plans for art, health, science, and social studies education.

For example, in A Guide to Curriculum Planning in Art Education, the curriculum base includes five generalizations: Aesthetics, Change, Communication, Human Wholeness, and Interdependency. Concepts under each of these are organized under: Art and the Individual, Society, and the Environment. For example, a generalization for aesthetics reads:

> *Involvement in art develops aesthetic awareness which can improve the quality of life.*

Some of the environmental concepts under this generalization are:

> *Art can reflect the order and aesthetic qualities of structural systems found in nature;*
>
> *Involvement in art can develop awareness of harmony between human needs and environmental aesthetics; and*
>
> *Aesthetics should be considered along with technology and economics in shaping of the natural and constructed environment.*

Environmental topics suggested for study in art include urban planning, historic preservation, and environmental awareness, excellent topics leading to the development of citizenship skills and opportunities for community service.

Environmental health is identified as a content area in A Guide to Curriculum Planning in Health Education. Some topics suggested for inclusion in the curriculum are: Litter (grade 3), Water Pollution (grade 4); Solid Waste (grade 5); Rodents and Insects (grade 6); Carcinogens (grades 7-9); and Government Regulation of the Environment (grades 10-12). For each of these levels, environmental health objectives and sample lesson plans are provided.

Consideration of the relationships among science, technology and society is one of four components of the curriculum suggested in A Guide to Curriculum Planning in Science. Under this heading, the identification and resolution of environmental issues and problems are of major importance. Likewise, much of what is studied at the elementary level under problem-solving is what environmental educators do when they try to help very young students develop sensory skills which contribute to an environmental awareness and sensitivity.

Finally, all four goals stated in A Guide to Curriculum Planning in Social Studies pertain in some way to the environment. In particular, "Participation and Civic Responsibility," and "Skills and Participation," two categories of environmental education objectives in the Tbilisi Declaration and in A Guide to Curriculum Planning in Environmental Education, deal with preparing citizens to become effective participants in the resolution of environmental issues and problems. Some of the major themes of the modern social studies curriculum also reflect an environmental orientation--Citizenship; Scarcity and Choice; Stewardship of Natural and Human Resources; and Survival Issues and Future Alternatives.

Thus, each of these four disciplines already has goals and/or objectives very similar if not identical to what we identify for environmental education. Other traditional subject areas--Mathematics, Music, English, Language Arts, etc.--play a different kind of role in environmental education, providing "vehicles" for attaining environmental education objectives, and vice versa. For example, the Project Learning Tree activity "Living Labels" is an elementary vocabulary development activity promoting the development of environmental awareness skills. And "Module II, Getting Started on Issue Investigation," in Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules, by Hungerford, et al., is excellent for helping middle/junior high students develop skills in using secondary sources to gather information about environmental issues and problems. Writing letters, note-taking, and using the Card Catalog and the Reader's Guide are language arts skills developed within the context of environmental issues and problems.

In summary, environmental education already permeates the curriculum. Why should we try to separate out "environmental education" to deal with it in isolation? Would it not be better to help teachers "environmentalize" curricula, to use environmental topics and environmental education approaches to achieve subject area objectives already established? But how can we "reeducate" teachers so they can carry out this task? I hope the discussion today stimulates discussion of that question.

REFERENCES

Adler, Mortimer J. The Paideia Proposal: An Educational Manifesto. New York: MacMillan, 1982.

Boyer, Ernest L. High School: A Report on Secondary Education in America. New York: Harper and Row, 1983.

Bradley, Chet. A Guide to Curriculum Planning in Health Education. Madison, WI: Wisconsin Department of Public Instruction, 1985. ED 264 233.

College Board. Academic Preparation for College: What Students Need to Know and Be Able to Do. New York: The College Board, 1983. ED 232 517.

Dowling, Kenneth W. A Guide to Curriculum Planning in Science. Madison, WI: Wisconsin Department of Public Instruction, 1986. ED 271 327.

Engleson, David C. A Guide to Curriculum Planning in Environmental Education. Madison, WI: Wisconsin Department of Public Instruction, 1985. ED 264 134.

Goodlad, John I. A Place Called School: Prospects for the Future. New York: McGraw-Hill, 1983.

Hartoonian, H. Michael. A Guide to Curriculum Planning in Social Studies. Madison, WI: Wisconsin Department of Public Instruction, 1986. ED 268 038.

Hungerford, Harold R., et al. Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules. Champaign, IL: Stipes Publishing Company, 1986. ED 257 664.

National Commission on Excellence in Education. A Nation at Risk: The Imperative for Educational Reform. Washington, DC: U.S. Government Printing Office, 1983. ED 226 006.

Newmann, Fred M. "Educational Reform and Social Studies: Implications of Six Reports." Contemporary Education Review, 3(2), 363-379, Fall 1984.

Rayala, Martin. A Guide to Curriculum Planning in Art Education. Madison, WI: Wisconsin Department of Public Instruction, 1985. ED 268 033.

Sizer, Theodore R. Horace's Compromise: The Dilemma of the American High School. Boston: Houghton Mifflin Company, 1984.

Task Force on Learning as a Profession. A Nation Prepared: Teachers for the Twenty-First Century. New York: Carnegie Forum on Education and the Economy, 1986. ED 268 120.

Western Regional Environmental Education Council. Project Learning Tree: K-6. Washington, DC: American Forest Council, 1987.

The Problem of Curriculum Infusion in Environmental Education

Milton McClaren

> *"infuse, v.t. 1. to introduce as by pouring; cause to penetrate; instill (fol. by into). 2. to imbue or inspire (with). 3. to pour in. 4. to steep or soak (a plant, etc.) in a liquid so as to extract its soluble properties or ingredients." The American College Dictionary*

I must confess to a certain intercultural confusion with regard to the term "infusion." As a Canadian I first encountered the term when it was used by my colleagues on the Project WILD Steering Committee. I found myself unaware of its usage and meaning for curriculum developers and implementors. I later came to understand it to mean that a given piece of curriculum did not form part of the prescribed or mandated curriculum for the particular school authority, be it a state education department or a local school board. In this context, an "infused" curriculum was one which enriched or extended the core curriculum and was clearly optional for the use of teachers as a choice or elective. It is this latter characteristic that is of most importance to environmental educators who are interested in curriculum development and implementation.

In spite of many years of impressive rhetoric about the importance of environmental education on a national, international and even global scale, few jurisdictions have formally included it at any age/grade level as a mandated course or courses. This is not to say that many themes, concepts, strands, and topics of importance to environmental education do not appear in the mandated or prescribed curriculum of states and provinces, because they clearly do. For example, the current science and geography curricula of my own province, British Columbia, contain major segments of content that are directly related to environmental education. However, there is no course, or even a course unit or topic within the entire provincial curriculum that is actually titled "Environmental Education." A teacher who wants to develop the goals and objectives of environmental education can legitimately pick these from the matrix of existing curriculum and place emphasis upon them. But, equally so, a teacher who does not choose to do so can omit them entirely. To those who feel a strong sense that developing environmental understanding should be at the very center of the mission of public schools this is a frustrating situation.

From the earliest days of the development of the term "environmental education," curriculum writers in the field have recognized that there were two major implementation options available. The first entailed the development of entirely new courses having environmental education as their focus, whether called environmental education, ecological studies, or whatever. The second option involved the development of environmental education strands that could be woven (actually infused) through the fabric of the existing curriculum. Each approach has its peculiar strengths and weaknesses in terms of the overall goal of adding an environmental component to the educational development of school students.

The development of specific courses entitled "environmental education" seems attractive to many, especially to those who believe that the traditional pantheon of courses offered by the public schools is sorely in need of revison, if not complete reconceptualization. They are committed to the importance of environmental education. They believe that school authorities should acknowledge that commitment by formally authorizing the inclusion of environmental education in the school program and by requirinq teachers to teach it, while students are required to demonstrate their learning of the field. Furthermore, they contend, this approach has the advantage of dedicating resources and funding for environmental education, which then become regular line items in the budgets of the schools.

The advocates of the "strand" or "theme" approach contend that the development of environmental understanding, awareness, and ethics is an on-going task of continuing education. Thus, the developmental nature of environmental education is better served by weaving environmental concepts through the fabric of the curriculum from kindergarten to twelfth grade. Ideas and concepts presented in the early years re-emerge in later grades so conceptual complexity can be developed in a spiral fashion. This approach also often seems to fit better the interdisciplinary nature of environmental education. It is integrated across many subject fields, crossing disciplinary boundaries and fostering communication among disciplinary specialists rather than becoming a new discipline in its own right.

The supporters of the mandated approach will argue, often correctly, that the strand or theme approach means that environmental education suffers from the phenomenon of the Tragedy of the Commons--namely, that that which belongs to everybody in effect belongs to no one (and is undertaken by no one as a serious responsibility). The thematic approach, they also argue, leads to a lack of coherence and is difficult to assess in terms of what students have actually learned. Furthermore, it is claimed, in the thematic approach too much depends upon the teacher. The teachers may have a commitment to environmental education and may emphasize it, but the key word is "may." Students also may in fact learn many important environmental facts and concepts, but may not acknowledge them as such, or may view them as abstractions having little to do with their daily lives and behavior. Furthermore, without a clear commitment of resources, including a dedicated time slot in the school program, it is simply too easy to crowd environmental education off the agenda when there is intense competition for time from the many other groups and advocates demanding a place in the public school curriculum.

There are, however, also dangers accompanying the mandated approach. If the mandate means that environmental education is in fact taught (or "covered") at a single point in the curriculum, as a required course or unit of study, then students and teachers alike may well view that as "done," as having been taken, and dismiss it thereafter. The political nature of the process of getting a course mandated can inevitably result in some seeing themselves as winners, while others lose. The losers may later gain authority and strike environmental education from the school program as part of their mandate. Those who are calling for the public schools, especially secondary schools, to return to a core of basics to be taught to all students and to be learned to a high level by all, with a very restricted set of electives, will often exclude any courses in environmental education as peripheral to the core. When a course is mandated it can have dedicated funds and resources, but it is also easy to identify those, and to remove or reallocate them if the currents of curricular opinion shift. Teachers, moreover, may resent a mandated course or courses being imposed on them from above, resulting in less than effective implementation and poor teacher attitudes.

From the above comments it can be seen that either option has its strengths and weaknesses. The implementaiton of curriculum ultimately depends on teacher support and commitment. The classroom teacher is at the center of the transaction of public schooling. No matter how much curriculum theorists and developers may believe in the value and importance of their programs, and no matter how elegant their designs may be on paper, in the final analysis no curriculum can be (or should be, in my opinion) teacher-proof. The proponents of mandated curriculum, whether in environmental education or arithmetic, all too often forget this. To them, the curriculum is simply a technology to serve their purposes, and teachers are merely cogs in the machinery. But teachers, like workers of other kinds, like to feel pride in their work, a sense of purpose and accomplishment, a sense of value, and of personal ownership or involvement. Teaching is one of the most solitary forms of human work. Teachers work day after day alone with their students, without actual on-the-job contact with other professionals as they perform. Lawyers see each other in courtrooms. Doctors often work together in surgical teams or on rounds. Dentists may work with an assistant or hygienist. Workers in construction or manufacture work in teams or groups. Teachers all too often get little information about their work from other professionals, despite all that has been said and written about clinical or developmental supervision. Thus, to be successful a curriculum must first win the hearts and minds of the teachers who will use it. Administrative fiats have little impact on what actually happens in the classroom. Whether a program in environmental education is to be a part of the mainstream, prescribed program, or is to form an available option to teachers, the developers need to recognize this.

Environmental education should have an advantage in the task of engaging the personal commitment of teachers. After all, many teachers would agree that there is a need for students to learn about their environment and to make better choices about it. The mission or purposes of environmental education are valid and have value for many. However, this is not enough. To be effective, an environmental education curriculum should make teachers feel good about themselves and their work and should provide opportunities to break through the isolation of daily teaching. This latter fact is why, I would contend, so many teachers return year after year to pro-development workshops that they have taken before. They do it in order to meet others, to socialize with their professional peers, to celebrate a common purpose. The designers of infused curricula often develop networks of workshops and support materials. They also distribte the T-shirts, cups, caps, pins, and badges that form part of the celebration or hoopla of commonly valued purpose. They do so in the hope of attracting and sustaining the commitment of teachers because they know they must do this if their programs are to be used. On the other hand the developers of mandated programs may assume that the weight of the legal status of their programs will suffice to engage the commitment of teachers, a serious error. Successful curriculum implementation, whether of infused or mandated programs, depends on developing a social transaction in which the teacher is given an opportunity to participate, to become a co-developer as well as a user of the program, and through which the teacher becomes part of a team. The team has a sense of common, valuable purposes, provides an opportunity for professional growth, and gives teachers a renewed chance to feel pride in their work and a sense of accomplishment.

Much has been said and written about the need for infused curricula to correlate with the mainstream program in order for the courses to be used. Many valid points have been made and the exercise of correlation is often revealing as much in what it shows about the core curriculum as in what it demonstrates concerning the infused offerings. It is important, however, to understand that teachers are incredibly busy people, people with a host of problems to address, limited time, and a wide spectrum of often competing options that may be used to address the problems. To be successful any new program, infused or mandated, should make the work life of the teacher better, it should help the teacher address problems, and it should have practical as well as educational value. Many a curriculum has failed in implementation because although it was of great educational value it simply made the working lives of teachers more difficult or complex or demanded skills that they either did not have or had little chance of developing. A well correlated infusion curriculum will clearly appeal to the classroom teacher as having the potential of addressing problems that they have in teaching the regular program of the school, but correlation alone will not guarantee use.

As I have examined the other papers contributed to this symposium I have identifed a set of points which might be termed the pro's and con's that are set in balance in the implementation of any environmental education program, whether infused or mandated. I have touched on some of them above, but I will summarize them briefly here once more and add a few other points. First, let us examine the plus side of the ledger. Environmental education as a field is rich in opportunities to provoke student thinking and learning of action strategies. Given the current resurgence of interest in critical or effective thinking in schools, this is very much a positive point. Second, environmental education is seen by many people in society as being of value, and as having importance. This is not to say that there is a consensus that schools should teach environmental education, because there is no such consensus, but there is widespread concern about the quality of the environment and about conservation. Third, environmental education is likely one of the things that students must learn as we move from an Industrial to a Post-Industrial society. This means that it is a likely candidate for inclusion as a 21st Century basic.

On the negative side of the ledger for the likely implementation of environmental education there are some major items. First, environmental education (like STS education, or STSE) requires that classroom teachers begin to use models of teaching and teaching strategies from Families outside the dominant Information Processing Family of Models and furthermore from outside the most commonly used models within the information processing genre. As John Goodlad and others have pointed out, the variety of instructional approaches used by teachers declines across the grades from K to 12 with senior secondary schools being dominated by the lecture-text-recitation modes. Teachers may well need to use models such as the Social or Jurisprudential. To do so will demand the learning of skills which teachers now seldom employ, if in fact they have them at all. Second (and several papers at this symposium make this point), environmental education implies action. But public schools are extremely wary of action. Once students move from the safety of the classroom into the larger domain of action especially in community settings, then the safety of detachment is lost. It is my view that there are things to be learned through action that can simply not be learned in any other way. There is a kind of information that becomes available in the course of an action that doesn't exist without the action. By continually avoiding the connection between learning and action, public education has seriously disempowered students by removing an entire kind of feedback from the cycle of learning. Moreover, when students act they are often in need of the sort of mentorship that only a skilled teacher can provide in order to convert experience into meaning. But again, many teachers find themselves severely challenged by this sort of teaching. Third, environmental education is often issues-oriented. If this is so, then the word issue provides a problem or opportunity that is affect-rich. Such issues are a challenge to the dominant tone of many classrooms--namely, emotional flatness, to use a term from Goodlad. We want students to care, and to care strongly in an informed fashion, about the environment. But we are nervous when their passions and energies are ignited and we worry about losing control. Again, this presents a severe challenge to the teaching skills of many teachers. Table 1 summarizes the above pro's and con's.

TABLE 1

The Pros and Cons of Environmental Education as a Topic for Curriculum Implementation

Pros	Cons
1. The development of improved environmental knowledge and understanding is seen by many as being of educational value.	1. Environmental education requires the use of models of teaching and teaching strategies with which many teachers have little skill or experience.
2. Environmental education is rich in topics that can develop student critical thinking and skill in research and inquiry.	2. The issue orientation of environmental education introduces topics that are rich in values and affect. This challenges the dominant tone of emotional flatness and control.
3. Environmental education is rich in opportunities for the teaching and learning of action strategies.	3. Environmental education implies action. Many school authorities and teachers are wary of action and have few skills in action strategies.

I set these two columns in the implementation ledger against each other not to overwhelm the potential developer of environmental education curricula, whether of an infused or mandated program, but to remind them that if we really take environmental education seriously as a purpose then we will have to do more than construct elegant blueprints. It is my view that we have a major task to accomplish in assisting teachers to carry out the curriculum and to become actively committed to it. From the above it will be evident that in a sense I view all curricula as infused. They must percolate into the curricular mix and culture of the school. This is unlikely to happen unless we pay careful attention to the critical role played by teachers in using curriculum. The developers of mandated programs can learn much from careful study of successful infused curricula, programs that teachers willingly opt to use year after year and about which students demonstrate clear enthusiasm and evident learning. However, the operators of infused curricula need to realize that often the success of their programs derives as much from the social support system that they create for teachers as from the educational merits of their materials, clear as these may be. Even the most enthusiastic teachers will gradually lose their commitment if they believe that no one knows or cares about what they are doing.

Finally, there are those who believe in what is now termed Deep Ecology. There is nothing new in the proposition that the development of an ecologically sound life style may be in opposition to the accepted metaphors of the industrial era, including industrial schooling. The idea of human resources, for example, implies that humans are resources, to be processed and developed, or who have value only in terms of how much they earn, how hard they can work, or how much they produce. In other places I have written that the central shift in focus as we move from an industrial era to a post-industrial one is the change in metaphor from the development of human resources to the nurture of resourceful humans. But metaphoric or paradigmatic shifts of this sort are profound. They can only emerge through a process of infusion. To those impatient with that view, or concerned that the urgency of environmental problems justifies any means, including the most authoritarian models of education placed at the service of the good cause of environmentalism, I can only say that efforts at infusion may indeed fail at times. The potency of the agent being infused may be too low. The receptivity of the medium may be too limited. But, when the time is right the process of infusion will result in transformation and both the medium and the message of public schooling will be changed in a significant manner. On the other hand, authoritarian approaches through mandate and requirement may appear to succeed, but their success will be short-term as long as the dominant conditions on which they are superimposed remain the same. There is a need for a post-industrial curriculum, but I see that process as more likely to occur through infusion than by directive or mandate.

In the meantime all environmental educators need to retreat from emphasis on goals, objectives, aims, and activities, as useful as these are at times. We need to ask ourselves an important organizing question: if we succeeded in our educational endeavors, what would the result be in terms of entire, intact, whole, functioning human beings? What does an environmentally good citizen look like, not as a living list, but in descriptive terms? Try to write a one-paragraph, literary or descriptive account of such a person. It is, I think, from such a holistic vision that the most effective long-term curriculum designs will ultimately derive.

Environmental Education: The Right Product at the Right Time

Rudolph J. H. Schafer

I was born in Los Angeles a great number of years ago and was raised by grandparents. My grandfather had been a salesman for most of his life, and he viewed his profession as a noble calling. "Everyone is selling something," he used to say, "a product, an idea, an ethic, yourself, your skills and talents." He was pleased and proud when I told him I wanted to become a teacher: "Teachers are the most important sales people of all. They sell students on themselves--what they are and what they can be."

Grandfather had a strong sense of ethic in all that he did, and he had two firm rules he followed in all of his sales activities. First, always sell the best, your product must be the highest possible quality, and one that is good for the buyer and society. Secondly, consider the best interests of the customer in all transactions. Never sell anyone anything which is not right for them.

I have never forgotten grandfather's advice, and have for the past thirty years or so considered myself a salesman of environmental education. In all modesty I believe I have enjoyed some success in this undertaking, and would like to share some thoughts with you which may prove to be of value.

First of all, going back to grandfather's two ethical rules for a salesperson, we do have in environmental education the best possible product for students at all levels and the general public we serve. It is something in which we can believe, and which will be of long-term and lasting benefit to society. Secondly, environmental education is certainly "right" for those students and publics we are trying to reach. I believe that it is important for us to accept these basic assumptions and the sense of mission which goes with them if we are to be successful.

Well then, how do we go about selling environmental education? First of all, communications specialists will tell you that in order to get an idea across, you have to be able to conceptualize it briefly in terms your audience can understand. I have read a good many definitions of environmental education, many of which run a page or more using esoteric language, which are of little or no value in communicating with people outside of the fold. Let's give some attention to developing a brief, readily understandable definition of what it is we are all about to assist us in reaching others. For me I tell people I am trying to help students of all ages learn how to make wise personal and social decisions in respect to spaceship earth. Not perfect, but highly useful. Perhaps we should get some help from outside the environmental education field in developing our communications skills. We also need to have outsiders tell us how they see us and what they are hearing us say. How do minorities see us? School administrators? Elected officials? Teacher union officials? We need such feedback if we are to communicate with the various publics essential to our success.

A second factor essential to our success is to understand that what we do is far more important than what we say. It is important for all of us in environmental education to have a personal environmental ethic and to be involved to whatever degree possible in efforts with others to preserve environmental quality. A successful teacher becomes a role model for the students he or she serves. We must be sure that the example we set communicates the environmental education message. We should note also that doing or saying nothing also communicates. If we ignore individual or social resources or environmental concerns, we are saying that they don't exist or that the individual's behavior is acceptable. We must, of course, avoid becoming zealots, thereby turning people off. It is possible to communicate our positions in ways which are readily understandable yet do not offend.

Another important way of getting things done is to find out who your friends are and get their help. Generally speaking, I have found resource management professionals to be interested in and supportive of environmental education. The great success of Project Learning Tree and WILD attests to this conclusion. Most of the money and effort which have made these programs successful have come from management agencies. There can be a problem in dealing with agencies. They have to understand that the purpose of good educational programs is equipping students to make good decisions, not blindly accepting their agency policies or programs. Both WILD and PLT have been successful in this respect, and most of the management professionals involved have accepted the premise that our job is to teach students how to think, not what to think. In dealing successfully with resource management people I have articulated the concept that education and resource management are future-oriented professions. Educators work with--or conserve--the human resource, while management people work with--or conserve--natural resources. Our goals are interdependent, and so we should be working together.

Business and industry can also be helpful in advancing the environmental education cause. The outstanding example is Project Learning Tree which was and is funded entirely by the forest industry. In California several of the electric utilities work with educators in a variety of ways to help students understand the problems of generating and supplying electricity, and the need for conservation. Once again, the basic nature of education must be understood: we're not there to push company policy or to help them with their public image. I have found in my work that these problems can be solved and that most responsible industry people respect the professional ethics of the education profession. Some environmental education purists spurn industry money saying it is tainted. My answer is that there "taint" enough of it!

Another source of assistance of benefit in local community programs is that offered by citizen organizations. In California we have discretionary money which can be granted to non-profit citizen organizations, and several groups have developed on-going programs of great benefit to students and the community. Examples include a volunteer senior citizen organization which makes members available for local school nature walks, a county-wide organization which raises funds and performs valuable services in support of a resident outdoor school, and a Bay Area group which offers a variety of teacher training programs, field trips, and other activities.

When I first went to work for the California State Department of Education, I realized that I needed legislation which would require environmental education instruction and which would assure a stable base of funding for local programs. I made the acquaintance of a legislative staff person who very quickly taught me the facts of life for getting a bill through the legislature and helped me draft what was needed. Through this person's essential assistance I got what I wanted and was able to accomplish far more than I otherwise could have over the past twenty years as a result. There are such people at all levels of government. If you need help, look for them.

Unfortunately, the need for environmental education is not universally recognized--particularly among educational administrators. It therefore becomes necessary to deal with blockages and blockheads. Generally speaking, you find ways to go over, around or underneath such people if all else fails. Having lots of friends certainly helps. You have to learn how to do things in such a manner that you don't create a lot of enemies so that no one stabs you in the back when you least expect it. I don't know why it is that educational administrators place such a low priority on environmental education. I would suggest that some research is needed here which would help us understand the views of school administrators on the subject and suggest approaches which might prove successful.

I try to use analogies and metaphors in my speaking and writing which create easily remembered pictures in the mind of the audience. One which has been successful is the shaggy dog. It you are a little flea in the whole education picture, the most efficient way to travel is via a shaggy dog which is going the direction you want to go. Some of the most useful shaggy dogs available to us are basic skills, citizenship education, science education and practical arts. I am sure there are others. Be on the lookout for them, and use them when you can.

The great interest in drug abuse, dropouts, teenage suicide and similar social problems suggests a new shaggy dog. There is a parallel between environmental pollution and personal pollution via drugs, alcohol and tobacco. "What would you say if someone dumped dangerous chemicals in a local river or lake? You would certainly object, wouldn't you? Well, does it make any sense to pollute your body with similar harmful substances? You would certainly hate to see our forests, agricultural lands or minerals misused or destroyed, wouldn't you? What about your potential human resource? Is that any less valuable? We care about habitat for all forms of wildlife. Should we not also be concerned for the habitat for our fellow humans who do not have proper shelter or other necessities of life?" Perhaps this comparison of natural and human resources offers a way to relate environmental education to problems the school people see as critical. Certainly the idea is worth further development.

Another important principle of making progress in environmental education or any other human endeavor is to start doing something which will move you toward your goals. Some people wait forever--for approval of the boss, for the grant to be funded, for someone to hire them--and there they sit while the world passes them by. If you have a good idea, have checked all angles and are sure of yourself, then go ahead. If you are right, the money, support or whatever it is you need will come. And remember, don't be afraid to take chances. It is a lot easier to apologize than get permission. I have received many awards for my work in the environmental education field. In almost every citation I have been commended for things I just started doing on my own. Ninety percent of the time things worked out, and I received the support and approval I never could have obtained by going and asking beforehand.

In closing, I want to leave with you a caution not to become discouraged. I have been active in the field for nearly 30 years, and I know we have made great progress. Maybe I won't see all that happens in the next 30 years, but I know that additional progress will be made. Let me conclude with a homely story which hopefully makes the point.

In the dark days of World War II when England was just about destroyed by the German bombers, Hitler secretly invited Winston Churchill to meet with him and Mussolini to discuss the situation. "You are beaten," Hitler screamed, "I can destroy you as easily as I can shoot those fish in that fishpond." Churchill pointed out that things are sometimes not as easy as they seem. "I'll show you," Hitler said, pulling out his Luger and pumping several shots into the pond, but hitting none of the fish. "I'll show you how to do it," said Mussolini, who began slashing through the water with his dagger with no success. When both finished, Churchill began dipping water out of the pond with a soup spoon. "What are you doing, you idiot?" Hitler shouted.

"It may take awhile," replied Churchill, "but we will persevere."

And so environmental educators, we too will persevere. We have the best possible product, and it is right for the various publics we serve. Let's take a deep breath, look up and get on with our journey.

An STS Perspective on Environmental Education in the School Curriculum*

Peter A. Rubba

How does environmental education fit into the school curriculum? The anticipated response to this question would consist of a treatise on the interrelationships among the goals of a K-12 education, environmental education, and other areas within the school curriculum. The author will leave such exposition to those who are eminently more qualified to do so. The perspective taken herein emphasizes the guiding role environmental education has played and should continue to play in the emergence of science-technology-society education--STS education for short--within the K-12 curriculum.

The Rise of STS Education

The precursors of a science-technology-society (STS) view on school science education can be traced back to the early parts of this century in a number of commission reports (Hurd, 1985). Still, it was not until the early 1980s, as a result of STS education being endorsed by the blue-ribbon groups which examined the status of science education in the United States (Aaronian and Brinckerhoff, 1980; Harms and Yager, 1981; NSTA, 1982; NSB, 1983), that STS actually became a focus in K-12 science education. At the state level, departments of education have moved to structure goals and objectives, curriculum guidelines, course requirements, and teacher certification standards for precollege STS education (Rubba, Barchi, and Wambaugh, 1987). At the teacher training level, STS education is becoming a common topic in preservice science methods courses.

Secondary science teachers have been the leaders of STS education at the precollege level by infusing science and technology-related societal issues into extant science courses and developing related course materials, irrespective of whether or not state or local mandates exist. Individual instructional material developers and commercial publishers recently have begun to respond to the STS movement with the introduction of textual materials which include a societal issue flavor, and with the publication of separate STS modules. Despite some early opposition among the science education community (e.g., Good, Herron, Lawson and Renner, 1985), STS education has been adopted as a viable part of the secondary school science curriculum in the U.S., as it has recently in Canada and much earlier in a number of European nations.

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*This paper draws from and extends previous works by the author and others as cited herein. The contributions of Randy Wiesenmayer and Harold Hungerford to the author's thinking on STS education are gratefully acknowledged.

Examination of extant documents and materials relevant to STS education at the secondary level (e.g., state documents, syllabi and texts used in science teaching methods courses and workshops, curriculum materials) shows a prevalence of examples which are aligned philosophically with the social responsibility perspective of STS education--the perspective which emerged from the blue-ribbon reports and which since has become the most broadly accepted. The social responsibility perspective dictates that the ultimate goal or purpose for integrating STS into the school science curriculum is to help students develop the knowledge, skills and affective qualities needed to take responsible action on the myriad of STS issues facing humankind (Rubba and Wiesenmayer, 1985). However, the few snap-shots we have of STS educational practice show an incomplete implementation of that perspective.

Rubba (1986) and Rubba and Wambaugh (1987) asked secondary (grades 7-12) science teachers from Illinois, and biology and life science teachers from Pennsylvania, to identify the science and technology-related societal issues they include in science courses, and the instructional procedures used to do so. The societal issues the teachers reported they infused into their science instruction were few in number (between 2 and 5 per course, on average) and rather predictable (e.g., land use for earth science teachers; energy use issues for physical science and general science teachers; genetic engineering and environmental pollution related issues for life science, biology and advanced biology teachers; nuclear power generation and nuclear warfare for chemistry and physics teachers). They tended to be high visibility, global or national environmental issues, especially among the chemistry and physics teachers.

Surely, genetic engineering, nuclear power, and nuclear war are among the most critical issues which face humankind (Rifkin, 1985); ones which will require expansive effort and significant resources if they are to be resolved. But, they are not necessarily the science and technology-related societal issues which are of primary concern in those sections of the U.S., or societal issues with which secondary level students can easily identify and get directly involved. In contrast, few of the teachers addressed societal issues related to waste management or water quality, significant issues within both states which also lend themselves to student investigation and action. But then, the instructional procedures the science teachers used were essentially those they use to "teach" science concepts--the lecture, with films/slides/videos, discussions and labs. Milton McClaren (1987) spoke earlier in this symposium to the inappropriateness of these instructional procedures and the problems associated with getting teachers to adopt ones which are better suited.

When asked to specify the percentage of science class instructional time they believed should be dedicated to preparing students to deal with science and technology-related societal issues, the teachers recommended 15% on average, a value which is close to those recommended in the report of the first Exeter Conference (Aaronian and Brinckerhoff, 1980) and by NSTA (1982), but one none of the teachers themselves came close to fulfilling.

While it is not claimed that the findings from the two studies are representative of science teachers in general, that suspicion is expressed (Rubba, 1986), based upon the work of Goodlad (1984), Hofwolt (1984), and Bybee and Bonnstetter (1987). Given that preservice and inservice science teacher education has focused since the mid-1950s, for the most part, on helping science teachers develop the capabilities to teach science for the goal of academic preparation (Harms and Yager, 1981), and given the relative newness of STS education to secondary science education, it is highly probable that science teachers are using traditional instructional procedures to bring STS education into the science classroom simply because they are familiar and skilled with those procedures, and are not with others they know to be more appropriate. Or, it might be because they believe that discussion, lecture, audio-visual media and labs are appropriate for STS education. Both speculations imply misconceptions on the part of science teachers concerning the goals of STS education at the secondary level.

The Implications of Recent Literature in Environmental Education for STS Education

The STS education literature is rich with papers which tout the virtues of STS education. However, the literature is sparse if one seeks curricular and instructional guidance on K-12 STS education, a weakness which has been clearly enumerated (Rubba, 1987a).

Volk (1984) and Disinger (1986) each present arguments which suggest that environmental education is, in fact, STS education. Notwithstanding, there is a substantial body of literature in the area of environmental education (EE), over a decade in the making, which has direct implications for STS education approached from the social responsibility viewpont. Four recent environmental education studies of responsible environmental action (Klingler, 1980; Ramsey, Hungerford and Tomera, 1981; Sia, Hungerford and Tomera, 1986; Hines, Hungerford and Tomera, 1987) and a goal structure for EE (Hungerford, Peyton and Wilke, 1980), in particular, have significant implications for STS curriculum and instruction.

The research of Sia et al. (1986) and Hines et al. (1987) showed that responsible environmental action is mainly a function of four factors: 1) knowledge of environmental issues, 2) knowledge of specific action strategies which might be applied to resolve an environmental issue, 3) the ability to take action on environmental issues (to apply the action strategies), and 4) the possession of certain affective qualities and personality attributes. These factors were clearly predicted in 1980 by Hungerford, Peyton and Wilke in a set of goals for EE which were later construct-validated in studies by Ramsey (Ramsey, Hungerford and Tomera, 1981) and Klingler (1980), as well as by the studies conducted by Sia and Hines.

This environmental education literature strongly implies that if STS education aims to help students develop the capabilities to make discriminating decisions on science and technology-related societal issues and take action on those decisions (a social responsibility view), then STS education cannot be limited to the type of curricular and instructional activities one would find at the lower levels of the Hungerford et al. goal structure, the foundations and awareness levels. That is, providing learners with an understanding of the science concepts and technology which underlie a societal issue is important, but probably will not by itself lead to action on science and technology-related societal issues by learners. It also follows that it is not sufficient for STS curriculum and instruction to assist learners in the process of exploring and clarifying their attitudes and values toward science and technology-related societal issues (e.g., vignettes and class discussions*). Neither is it enough for STS education merely to emphasize societal issue identification or account example issue resolution (e.g., case histories/studies).

The direct implication is: if STS education is to guide learners in the development of the knowledge, skills and affective qualities needed to make decisions and take action on science and technology-related societal issues in a responsible manner, now and in the future, STS education must directly address these capabilities. Learners must develop the capabilities to investigate and take action on societal issues. This means going beyond use of the lecture, classroom discussions, audio-visual resources and lab exercises.

Given that the "Goals for Curriculum Development in Environmental Education" presented by Hungerford et al. (1980) are based upon a social responsibility model of environmental education, it appeared to be an appropriate model to guide K-12 STS education. Rubba and Wiesenmayer (1985) adapted the Hungerford et al. hierarchy to STS education. That yielded a four-level goal structure for STS education in which the superordinate goal of STS education is "...to aid citizens in developing the knowledge, skills and affective qualities needed to make responsible decisions on STS (science and technology-related societal) issues, and to take actions on those decisions toward resolution of the issues" (p. 577). The subsequent goal levels are: Level I, the STS Foundations Level; Level II, the STS Issue Awareness Level; Level III, the STS Issue Investigation Level; and Level IV, the STS Action Skills Development Level. A corresponding set of 53 STS education competencies were composed by Rubba (1987b) to guide STS educational activities in grades 7 through 12.

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*In a recent study, Rubba (1988) found use of vignettes with class discussions to be an ineffective strategy for helping students meet the ultimate goal of STS education.

Corollary

Volk predicted in 1984,

> *The new emphasis in the science education community on societal issues, their investigation/evaluation and resolution, could add considerably to the "respectability" of environmental education, especially if environmental educators continue to strengthen their posture of serious issue-oriented education.*

Given the degree to which the recent literature on responsible environmental behavior has served to provide a basis for STS curriculum and instruction, and the paucity of research in STS education itself (Rubba, 1987a), it can easily be argued that just the opposite has occurred: that research-based issue investigation and action-oriented environmental education has contributed greatly to the respectability of STS education. One can anticipate that this relationship will continue, beyond the point in time when a substantial body of STS education research has been developed, due mainly to the quality, complementary work to which environmental educators are committed, but also to an arbitrary yet commonly made division between "environmental" and "STS" issues.

Ultimately, all science and technology-related societal issues impact the biosphere. Still, we tend to differentiate between "environmental" and "STS" issues. Those science and technology-related societal issues for which we recognize direct or overt ecological connections (e.g., energy consumption, land use, waste management, water quality) are referred to as "environmental" issues. These so-called environmental issues have been the primary focus of environmental education over the past two decades. Science and technology-related societal issues for which the ecological connections are of a more extended and covert nature, and for which the science-technology aspects are more easily recognized (e.g., sexually transmitted diseases, the right to life/death, technology in the workplace, organ transplantation) we tend to refer to as "STS" issues. Societal issues with a strong STS flavor typically have not been dealt with in environmental education programs.

Science teachers who desire to make science and technology-related societal issue investigation and action activities a part of science course(s) will find that environmental issues have distinct pedagogical advantages over STS issues on at least four counts. First, environmental issues are much more pervasive than are STS issues. Consequently, science teachers and students have a wider selection of locally relevant environmental issues than STS issues to investigate and act upon in most communities.

Secondly, though environmental issues might appear on the surface to fit more logically into life science courses because of their ecological foundation, a closer look reveals a content base which also involves the basic physical science and earth science concepts studied in secondary school science courses. Hence, there are multiple opportunities to integrate any one environmental issue, or environmental issues per se, throughout the school science curriculum, across a number of science courses--life science, physical science, earth science, general science, biology, chemistry and physics courses. Rubba's (1986) findings show that middle/junior high and high school science teachers generally recognize the applicability of environmental issues across the science curriculum.

Thirdly, environmental issues lend themselves to student investigation more readily than do STS issues, given there is a comparative wealth of primary scientific data which can be accessed by students through government agencies and library facilities within their communities and states, and/or through the use of first-hand scientific and social science data collection techniques.

Fourthly, environmental issues lend themselves to more direct action and a wider range of action strategies categories by students than STS issues typically do. Student actions on STS issues most frequently take the form of persuasion or political action (Rubba, 1988). Direct student involvement through physical action is more often an option with an environmental issue than with an STS issue. These advantages impart a strong endorsement of the use of environmental issues as foci when science and technology-related societal issue activities (STS) are made a part of science at the middle/junior high school and high school levels.

Many teachers and administrators, especially in states which require two or three years of science, see STS courses as viable options over academic-oriented chemistry and physics for "lower ability students." The author favors an approach wherein societal issues investigation and action units are made a part of science courses starting at the middle/junior high school level and running through the entire secondary science curriculum. Environmental issues would be the themes of these units at the middle/junior high school level. Societal issue investigation and action units at the high school level might focus on STS issues if students have had similar experiences at the middle/junior high school level with environmental issues.

This recommendation is consistent with the pedagogical advantages of environmental issues noted above, the letter and spirit of the NSTA (1982) endorsement of STS education, and parallels, for similar reasons, one made for environmental education in a paper presented earlier in this symposium by Harold Hungerford (1987). Additionally, this recommendation is based upon the understanding that students need distributed practice and multiple opportunities, which increase in complexity and extend over time, to develop complex behaviors and attitudes such as those implied by the ultimate goal of STS education.*

Furthermore, the author is familiar with a number of high schools in which the third-year STS course is looked upon by students, faculty and administrators as the dumping ground for students who are academically incapable of taking a "real" science course. Making STS issue investigation and action units a part of all secondary science courses eliminates the possibility that such perceptions will be formed, while at the same time it ensures that all students, including the "academic" students (who have just as great a need as any other group of students for STS education) develop societal issue investigation and action capabilities.

This does not preclude a middle/junior high school level course taken by all students at a particular grade level which has societal issue investigation and action capabilities as a major focus. An environmental education course based upon the four goal levels of the Hungerford et al. (1980) curriculum model for environmental education would the the author's preferred option in such a case. Notwithstanding, science and technology-related societal issues need to be a part of every secondary science course.

From this discussion one might argue that environmental education subsumes STS education, or that STS education subsumes environmental education, or that they, in fact, are parallel approaches to preparing students/citizens to deal in a responsible and direct manner with the ever-growing complexity of science and technology-related societal issues humankind faces, or ...Irrespective, the record is clear; STS education owes a large measure of its viability to environmental education.

REFERENCES

Aaronian, R., and R. Brinkerhoff. The Exeter Conference on Secondary School Science Education. Exeter, NH: Phillips Exeter Academy, 1980. ED 210 184.

Bybee, R., and R. Bonstetter. "What Research Says: Implementing the Science-Technology-Society Theme in Science Education: Perceptions of Science Teachers." School Science and Mathematics, 87(2), 144-152, 1987.

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*Randy Wiesenmayer, GTE Fellow in STS Education at Penn State University, has a doctoral study underway in which he is examining the effects of a societal issue investigation and action unit on solid waste management into a junior high school life science course on student outcomes in STS and life science. Findings from this study should be available in the Spring of 1988.

Disinger, J., and T. Wilson. Locating the "E" in STS. ERIC Information Bulletin No. 3. Columbus, OH: ERIC/SMEAC, 1986. ED 277 574.

Good, R., J. Herron, A. Lawson, and J. Renner. "The Domain of Science Education." Science Education, 69(2), 139-141, 1985.

Goodlad, J. A Place Called School: Prospects for the Future. New York: McGraw-Hill, 1984.

Harms, N., and R. Yager (eds). What Research Says to the Science Teacher, Volume III. Washington, DC: National Science Teachers Association, 1981. ED 205 367.

Hines, J., H. R. Hungerford, and A. N. Tomera. "Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis." Journal of Environmental Education, 18(2), 1-8, 1987.

Hofwolt, C. "Instructional Strategies in the Science Classroom." In: Research within Reach: Science Education, D. Holdzkom and P. Lutz, eds., 43-57. Washington, D.C.: National Science Teachers Association, 1984. ED 247 148.

Hurd, P. D. "Perspectives for the Reform of Science Education." Phi Delta Kappan, 67(5), 353-358, 1985.

Hungerford, H. "Environmental Education and Student Behaviors." Draft of a paper presented at the Symposium on Environmental Education in the School Curriculum, 16th Annual Conference of the North American Association for Environmental Education, Quebec City, October 1987. (See pp. 25-38 of this volume.)

Hungerford, H., R. Peyton, and R. Wilke. "Goals for Curriculum Development in Environmental Education." Journal of Environmental Education, 11(3), 42-47, 1980.

Klingler, G. "The Effect of an Instructional Sequence on the Environmental Action Skills of a Sample of Southern Illinois Eighth Graders." Unpublished Master's research report, Southern Illinois University at Carbondale, 1980.

McClaren, M. "The Problem of Curriculum Infusion in Environmental Education." Draft of a paper presented at the Symposium of Environmental Education in the School Curriculum, 16th Annual Conference of the North American Association for Environmental Education, Quebec City, October 1987. (See pp. 51-57 of this volume.)

National Science Board, Commission on Precollege Education in Mathematics, Science, and Technology. Educating Americans for the 21st Century. Washington, DC: U.S. Government Printing Office, 1983. ED 233 913.

National Science Teachers Association. Science-Technology-Society: Science Education for the 1980s. Washington, DC: National Science Teachers Association, 1982.

Ramsey, J., H. Hungerford, and A. Tomera. "The Effects of Environmental Action and Environmental Case Study Instruction on the Overt Environmental Behavior of Eighth Grade Students." Journal of Environmental Education, 13(1), 24-29, 1981.

Rifkin, J. Declaration of a Heretic. London: Routledge and Kegan Paul, 1985.

Rubba, P. "An Investigation of the Semantic Meaning Assigned to Concepts Affiliated with STS Education and of STS Instructional Practices among a Sample of Exemplary Science Teachers." A paper presented at the 1986 meeting of the National Association for Research in Science Teaching, San Francisco, March 1986.

Rubba, P. "The Current State of Research in Precollege STS Education: A Position Paper." Bulletin of Science, Technology, and Society, 7(1&2), 248-252, 1987a.

Rubba, P. "Recommended Competencies for STS Education in Grades 7-12." The High School Journal, 70(3), 145-150, 1987b.

Rubba, P. "An Investigation of the Effects of Infusing STS Vignettes into Biology Instruction on Learner Outcomes in STS." A paper submitted for presentation at the 1988 meeting of the National Association for Research in Science Teaching, St. Louis, Mo., April 1988.

Rubba, P., B. Barchi, and R. Wambaugh. "STS in the Nation's Schools: Six States Take the Lead." S-STS Reporter, 3(1), 1-4, 1987.

Rubba, P., and R. Wambaugh. "Changes in Biology Teachers' STS Instructional Activities." A presentation at the meeting of the National Science Teachers Association, Washington, DC, March 1987.

Rubba, P., and R. Wiesenmayer. "A Goal Structure for Precollege STS Education: A Proposal Based on Recent Literature in Environmental Education." Bulletin of Science, Technology, and Society, 5(6), 573-580, 1985.

Sia, A., H. Hungerford, and A. Tomera. "Selected Predictors of Responsible Environmental Behavior: An Analysis." Journal of Environmental Education, 16(2), 31-40, 1986.

Volk, T. "Project Synthesis and Environmental Education." Science Education, 68(1), 23-33, 1984.

Alternative Curriculum Models for Environmental Education

Chris Buethe

My views on the placement of environmental education in the school curriculum have evolved over the years, and I doubt if that evolution has stopped. One curious factor that I have observed is the negative thinking that interferes with environmental education. Some educators become very inventive at blocking the development of environmental curricula. Their reasoning seems to be:

> *It's everybody's job, so it's nobody's job, and certainly not mine.*
>
> *It's the science teacher's job; everybody knows that.*
>
> *It's technical, so it's for the technologists.*
>
> *Too little is known, so nothing can be done.*
>
> *It's global/international, so it's up to the President.*
>
> *It interferes with the economy, so it's to be ignored. Anyway, a lot of our kids' parents are farmers and miners, and they have already been hurt enough by do-gooders.*
>
> *Elementary kids are too immature, so delay environmental education until high school.*
>
> *We already picked up paper on the school ground and made posters; what more do they want us to do?*
>
> *High school kids need the basics; let's not trivialize their academic curriculum. (The U.S. went from "The Russians are coming" to "The Japanese are coming" to "The whole Pacific Rim is coming.") And environmental education won't help raise SAT scores!*
>
> *Environmental education is too time-consuming for the crowded curriculum, so we simply can't consider it. Besides, the teachers always want field trips, which are costly and dangerous.*
>
> *Teachers of environmental education favor certain topics over other good topics, imbalancing curricula.*
>
> *Environmental education breeds controversy, which is to be avoided; therefore, avoid environmental education.*

Plenty of excuses are given to tell why one should NOT have an emphasis upon environmental education in the schools. Curriculum specialists caution us about the difficulties in developing rational objectives for any curriculum; they also tend to condemn the use of disjointed incrementalism, that patchwork/political approach that shoe-horns new courses (e.g./AIDS?) into the schools today. (McNeil, 1985). No way seems to be the right way.

But environmental education resistance is one reason that we are having dialogue through NAEE. Mutually, we may help schools with more than the environmental education that is bootlegged into a few classes by a few concerned teachers.

As a former high school science teacher, I believed for a long time that science teachers know most and best about environmental things. Later, as my views and educational experiences expanded beyond the sciences, I came to feel that the environment is most wrapped in values, and that the principal teachers of values should be the ones who are most concerned with environmental education. I still feel that way.

Colleagues indicate that each of us has four basic feelings: mad, sad, glad, and scared. That view fits environmental education. Teachers get mad when given curriculum from the top down, so let's not give them imposed environmental curriculum projects. They are sad when they do not know what to do about environmental problems; that was inferred by my studies in Indiana (Buethe, 1987). Some are scared of environmental education because they see it as science or technology. Most of all, teachers are idealists who are glad to help pupils and their planet earth.

We need to go to the schools and ask educators questions like:

What is the most visible local environmental problem?

Which teachers are interested in teaching about that?

How can we help?

We will need to be careful that our egos do not interfere. I am often tempted to push "my" model of environmental education or "my" learning package. We need to remember that professional jargon distances us from the very people we want to help, so let's keep the language clear and simple. It will also be a mistake to repeat teacher-proof national curriculum projects like many of those of the post-Sputnik era; approaches that deny teacher input are naive (Connelly and Elbaz, 1980). We need to listen to teachers and students and to increase the glad part of environmental education. We need to stress learning experiences that are both content and value-oriented, that help the earth and make participants feed good while doing so.

My ideal case has no separate course for environmental education, but instead places the principal responsibility for its teaching in the hands of three groups of teachers. The key groups in that scenario are:

1. All elementary teachers of self-contained classes.

2. All social studies teachers.

3. Environmental resource teachers.

I believe that man, the social animal, is the center of all environmental education, and that attitudes and values are even more important than the knowledge of basic science principles and technology's potential. Cognitive studies of science without emphases upon human impact, economies, and international connectedness will yield few positive results for environmental education.

But that is the ideal case, where each K-12 teacher of social studies becomes environmentally literate and teaches and exemplifies appropriate environmental actions. My studies of Indiana K-12 teachers indicate that elementary and (particularly) social studies teachers are marginally literate regarding their environment (Buethe, 1986). However, I believe that able in-house environmental resource teachers can be identified in each school system, and that they can and should be supported to assist their less informed/experienced colleagues. Many informed and active environmental educators come from disciplines of science, but also may be from English, art, and other fields. They can serve as advisors, circuit-riding teachers, workshop and field supervisors, and effective multipliers of environmental education. They can prepare cadres of gifted and motivated students, who in turn can teach younger students. We have evidence that such a system works (Brown, 1979).

Let us set up an environmental curriculum approach that takes the best and latest information, puts it into the hands of those who want most to do the job, and evaluates outcomes on the basis of individual and societal behaviors over a sufficient time period.

I can envision a K-12 curriculum guide that is to be suggested by NAEE, that is tied into a multiplier model of teacher in-service education, that utilizes existing data bases and adds exchange/swap features, that is field-tested in selected school districts in three to five very different regions, and is evaluated mainly in terms of what participants do, both students and teachers. If, at the end of an extensive experimental period, sufficient gains can be shown, the plan will be exported. If, however, too little gain results, plan B--perhaps a separate course for grade eight called simply "Earth"-- will be initiated.

I do not want to see another such separate course. I do want to see the united efforts of NAEE, curriculum leaders, elementary principals, social studies teachers, and teacher power groups. We have a big job to do, and we need the power base of a big and powerful task force. I've done too many environmental/energy/special interest programs at ASCD conventions to believe that the main U.S. curriculum group is going to get very excited about any proposed new course; however, its leadership strongly favors critical thinking (Brandt, 1986). And what is more critical to think about than the set of critical environmental issues?

Let us resolve to continue dialogue that will lead to a united message to curriculum decision-makers. There are important fundamentals upon which NAEE agreements can be reached. We need to tell school leaders what must be taught and to suggest what should be taught. We need to suggest alternative curriculum models, sources of information and expertise, ways to make environmental education interesting, and ways to evaluate its results. We can.

REFERENCES

Brandt, Ron. "Overview: Building a Framework" (Editorial). Educational Leadership, 3, May 1986.

Brown, Jerry Dean. "Parent Perceptions of their Progeny's Environmental/Energy Behavior Resulting from Increased Cognitive Knowledge of Selected Environmental/Energy Terms." Doctoral dissertation, Indiana State University. Ann Arbor, MI: University Microfilms, 1980. #8029728.

Buethe, Chris, and James Smallwood. "Teachers and Environmental Literacy: Check and Recheck." Journal of Environmental Education, 18(3), 39-42, 1987.

Buethe, Chris. "Are Social Studies Teachers Environmental Illiterates?" Southern Social Studies Quarterly, 12(2), 60-64, Fall 1986.

Connelly, F. Michael, and Freema Elbaz. "Conceptual Bases for Curriculum Thought: A Teacher's Perspective." In: Considered Action for Curriculum Improvement, ASCD Yearbook, Arthur W. Foshay (ed.), 95-119, 1980. ED 186 428.

McNeil, John D. Curriculum: A Comprehensive Introduction. Boston: Little, Brown and Company, 1985.

(How) Can Interdisciplinarity Be Implemented?

William F. Hammond*

It is interesting to me that after more than twenty years of formal international environmental education program development and implementation efforts, which were preceded by a long history of nature, outdoor, and conservation education, the North American Association for Environmental Education has found it appropriate to convene a panel of environmental educators to address how to best deliver environmental education instructional programs. Why this current debate over whether it is best to "infuse" or "block insert" environmental education curriculum and instructional activities into school district instructional programs? Is this question symptomatic of our inability to answer even larger questions? These questions would include:

> *What indeed is a comprehensive environmental education program?*
>
> *How would we know one if we saw it?*
>
> *Given the current form of schooling institutions, is it possible at all to implement a comprehensive interdisciplinary environmental education program in any but our smallest school districts in North America?*
>
> *Is it possible to implement any interdisciplinary program in a moderate to large size school district in North America?*

I have struggled with these questions in the context of a relatively large and rapidly growing school system for the past eighteen years. In 1969, the Lee County School System submitted a Title III 306 Grant Proposal entitled Model Strategy for an Effective Environmental Education Program (Hammond, 1969). The proposal was funded for three and one-half years.

Since that time, as we worked to develop and implement a comprehensive Environmental Education Program, I have been doing what my great-grandfather used to call "slow learning." This approach to learning (uncommon today) occurs when you take the time to carefully, patiently watch something grow and operate. If you watch the objects, events, and the interrelationships carefully enough, you're likely to learn something from them.

What I have learned ever since childhood is that natural systems (those primary systems rooted in nature's patterns as we understand them) provide the most productive models to guide us in developing and implementing our educational programs as well as in addressing our life decisions. My bias is toward using natural metaphors in curriculum development. This view has been crystalized by the thinking of Gregory Bateson (1972, 1979) and, in more recent years, by the theory of self-organizing systems described by Jantsch (1980), Nicolis and Prigogine (1977), and Capra (1982, 1986). Derived from this world view, I use the following concepts as guideposts for decision-making, program design, implementation, and assessment.

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*This paper was presented in Quebec City by Randolph Tully, Environmental Educator, Lee County (Florida) Schools.

Key Operating Concepts

When looking at a system we must:

--consider the totality of relationships that define the system as an integrated whole;

--recognize the structure or physical pattern of organization in space and time;

--recognize that the organizing activity pattern is cognition or mental activity (Capra, 1982), and that the key operational characteristics for design and operation are the principles of:

> *Change--No system is static and, if you do not design and plan for change in the system, you will not succeed. Change in systems tends to be successional--being described in specific serial stages. Change creates the condition that fosters adaptation or extinction of programs and ideas. Change has a critical time dimension that must be considered. Patterns of change in cultural and educational systems have a spiral pattern of growth rather than a linear or cyclic one.*
>
> *Interrelationships--All parts, aspects or components, and operations in a system interact and are in continual micro to macro relationship with one another. Thus, no component can be considered in isolation.*
>
> *Optimal--Natural systems tend to operate in a pattern of order through fluctuation (Nicolis and Prigogine, 1977) characterized by autocatalytic steps which tend toward the central condition of optimal operation. By operating at optimal rather than maximal, natural systems tend to have reserve energy for addressing times of stress and/or crisis and disaster while they do not tend to operate at minimal levels of low efficiency in making use of the available resources.*
>
> *Diversity--Natural systems demonstrate diversity of states and elements. The diversity of natural systems is associated with the stability of the system--that is, its ability to adapt to or resist outside influences which would cause fluctuations. Natural systems tend towards optimal levels of diversity. Optimal levels of diversity in environmental education programs tend to optimize the options for all participants, particularly*

> *in the face of continual changes of school district curriculum and funding priorities.*
>
> *Self-regulation--While cultural and mechanical systems tend toward entropy, natural systems tend to be antentropic by continually managing themselves so as to budget for and accommodate growth and maintenance in a self-sustaining relationship with their environment. Natural systems do this in such a way that the integrity of their structure is maintained. They accommodate both growth and maintenance of all operations and components simultaneously. This is a dimension often overlooked in environmental education program design and implementation practice. Too often people design programs with little or no thought to long-term sustenance.*

These general principles have guided my bias as to what a comprehensive environmental education program must be and how it is to be best implemented. Inherent in this endeavor is the concept of time. The time perceived as available or necessary to complete the work greatly influences the strategy for program design and implementation. Thus, time must be considered as a very appropriate factor to contextual understanding.

Generally, in the institutional business of schooling, I have found that two basic strategies are employed for the design and implementation of curriculum-related programs. The first is characterized by a short but comprehensive development period and implementation process. The strategy can be achieved with high levels of available energy (big bucks!). The big dollars buy the concentrated time and attention of policy makers, administrators, teachers, and students for as long as the dollars are applied, which in U.S. history has typically been a one to four-year grant funding period. Using the first strategy, the designers must design and institutionalize the system rapidly but still in a manner that the program has the potential to be self-regulating and part of the culture once large financial support is withdrawn. While many spin-off benefits often accrue from this first approach, the history of survival characterized by continuous program identity, where the goals and objectives of the program truly become part of the organizational culture, is typically less than three years after withdrawal of grant funds. The second strategy involves the long-term application of modest amounts of energy over long periods of time (few dollars and lots of sweat!). The strategy for this type of design and implementation of an environmental education program is very difficult to sustain because it is very threatening for the members of a system to experience change of a system from within because it means change for them. When this second strategy is successful, it has a long-term impact because the changes become part of the culture and are thereby institutionalized.

It is important to establish these funding strategies as patterns that may legitimately shape the issue of environmental education delivery by infusion or by block insertion, or by some combination of these strategies.

To summarize my views of the key elements of an "infused" approach or a "block-inserted" approach, I would compare them as shown in Table 1.

TABLE 1

A Contrast Between Infused and Block-Inserted Curricula

Infused	Block-Inserted
-Curriculum components are integrated into daily instruction of all subjects with special environmental education objectives identified. In its ideal, it is a truly interdisciplinary study-learning experience.	-Curriculum components are provided in a defined time slot as a separate course or topic for study. Environmental education is delivered in a formal class as a disciplinary study with linkages made to other disciplines through discussion and practice.
-The approach tends to provide a wide variety of opportunities for environmental education-related instruction within the context of a variety of disciplines. Interdisciplinarity is emphasized. However, environmental education tends to lose its identity as a program. Infusion places environmental education in competition for space on the list of school objectives.	-Isolates environmental education from other disciplines by externalizing environmental education as a separate study in competition for a time slot in the school day.
-Is complex to design and package in concert with all the other disciplines.	-Is focused in its design into a discrete package or program which has high visibility and a clear identity.
-A full spectrum of teachers must be educated to understanding environmental education concepts as part of an ongoing inservice program, as well as trained in effective environmental education instructional techniques.	-Tends to minimize inservice to training teachers, centered on how to use the materials.
-Environmental education assessment is accomplished as an integral part of basic assessment in each discipline by flagging environmental education test items and guideposts of mastery performance of environmental education related values, skills and cognitive experiences.	-Assessment is directly coupled to the material taught in the course or unit as a discrete environmental education assessment component.

We must consider the context in considering which strategy to apply. The context then dictates in each unique case the most appropriate strategy for implementation. For me, the ideal is a wholistic environmental education program which infuses its instructional goals and objectives in every class, in every subject, throughout every day. It is also a comprehensive program that consists of discrete courses in Environmental Science, Environmental Research, Advanced Environmental Action Seminars. The ideal program also inserts blocks of environmental education as "in-depth" units of study into grade school classes and secondary courses on topics such as: Endangered Species--Life In A Dynamic Context, Values in Conflict, You As A Leader On A Dynamic Planet, You As An Environment, etc. In addition, even in the most infused local programs there are very appropriate niches for commercial and externally-produced, environmentally-related programs and activities, such as those from Project WILD, Project Learning Tree, Learning By Design-A.I.A., Project Adventure, People and Their Environment, Sunship Earth, The Class Project, Audubon Adventures, etc.

This discussion cannot be limited to implementation concerns alone but must also address the basic idea that delivery is based on a clear perception of what the philosophy, goals and objectives of the program are. As Paul Brandwein continually reminds us, we must be clear on the "what" that we call the curriculum. The determination of the "what" is always a political process, and therefore should be arrived at in an open process with a broadly-based constituency that arrives at the heart of what is to be taught in the context of the school system, the community, the state or province, the nation, the planet on which we reside.

The issue of infusion, block-insertion, or hybridization is at the core of "how" we will decide to deliver the "what" that students will be expected to learn. One must always be considered in relationship to the other. I am a firm supporter of a highly diversified delivery system because it affords more options for teachers and learners to master the "what" of our environmental education program.

I have listened carefully to those who say that the only way environmental education can succeed is to have a clearly defined, discrete environmental education program taught in a discrete block of time as a subject. They argue convincingly that the importance of environmental education dictates that it should get the time and resource support it deserves. I empathize with their frustration with the difficulty of infusing a comprehensive environmental education program in an already politically saturated curriculum operated by overcommitted teachers, serving large quantities of students, supervised by people who are often full of "turf anxiety" and need for control in a culture set in an unsettling era of transformation. I tend to find those with a total commitment to environmental education as a course to be taught in a discrete block of time in a scheduled period to be those environmental educators worn down by the system, who have gradually had the goal of an infused comprehensive environmental education interdisciplinary curriculum totally eroded from the stream banks of their minds. I also find those educators too impatient or lacking in the skills to invest time and commitment to the continuous political endeavors which the goal of infusion requires if it is to be attained. Another type of advocate for "block insertion" strategies is too often the advocate with a special interest, a program to market, a "turf" to sustain, a visibility to maintain. It is very difficult for commerical entrepreneurs to peddle their wares in an ecological system where market segments needed for sales promotion are not discrete. When environmental education is everyone's business all the time rather than that of specific teachers for one hour per day, 180 days a year, it is hard to sell an environmental education program as a package or capsule. The market becomes too complex and sophisticated for mass adoption of an "all you need environmental education program" with philosophy, goals, objectives all defined, with supplemental activities and readings, teacher's guide, easily replaceable kit of support materials for class and field trip experiences, audio visual materials, a teacher training program (conducted by one of their trained facilitators for a very modest fee), and an option for a subscription to their modestly-priced newsletter and related publications.

When I turned to natural systems for insight, I note that the most rapidly formed rock fractures and erodes most readily; the desert cloudburst's torrent of life-nurturing rain must be quickly gathered as it passes in its rapid return to sky and beyond; the most rapidly-paced creatures live the shortest lives; the most ephemeral of plants produce the shallowest of roots, while the most ephemeral of insects enjoy the shortest dances of flight.

To me the lesson is clear. Just as in nature, the short cycle, the quickly formed, the most ephemeral, serves an important component link within a system. However, in the business of schooling, the niche of the ephemeral, the quickly formed, the short cycled, is rarely a strong enough link to support an environmental education program. We must invest in building strong, well-developed roots, or well-formed crystalline matrices if we are to indeed develop an environmental education program that accommodates change and considers complex educational, institutional, economic, political, human, and life-nurturing interrelationships that are characterized by diverse components operating at optimal levels in a self-regulating and sustaining manner. Sound environmental education programs are built carefully, over time, with an openness to participation in determining what they are to be, and how they are to be implemented. In this manner an environmental education program grows from its context. It becomes the handiwork of the stakeholders and a part of their value system and territory. Once this bedrock is formed, a natural environmental education program will emerge.

It may well be that the best decision made in context is to begin to work toward our goals by choosing within our philosophy a well-conceived, ready-made commerical program that will get us started. We will all teach the program three+ periods per week. Then, once we gain experience, we will add our own components to the program. Just as plausible is the decision that, once the homework is completed on our environmental education curriculum framework, we will take a year to explore different available programs and develop our own environmental education program as a part of Science, Social Studies, Math, Language Arts, Art, Music, PE, Industrial Arts, Home Economics, Foreign Languages, Student Government, and our student activities program. We can also work on new environmental education instructional options in our school facilities, campuses and communities.

The point in the above statements is that if the program is built from an initial seed that is well tended, the program is likely to live not only long enough to put on foliage and blossom, but to put forth new generations of seeds and plants ad infinitum! Our problem in the field of environmental education today is that there are too many individuals who want to institute environmental education programs in the schools of the world without much understanding of the North American Institution of Schooling. Their lack of public school experience, their zealousness and naivete, place them in a dilemma summarized in the following verse:

You can't speak of oceans to a well-frog
The creature of a narrower sphere
You can't speak of ice to a summer insect
The creature of a season.
--Chuang Tzu
3500 B.C.

If we want to understand the institution of public schools and their unique subculture, we must familiarize ourselves by reading the research outside of environmental education--research from curriculum and instruction, staff development, effective schools literature. We must go into schools, work with teachers, administrators, students, and parents. It is only then that we can understand how to best plant the seeds of environmental education in that unique context. It is only then that we will know whether it is better to infuse, block insert, or hybridize our delivery of environmental education. Contrary to the perception of many school administrators and educators entrenched in reductive school behaviors, I believe the environmental education endeavor is a timely one as environmental education is not just another passing fad but a fundamental--indeed, a basic study of core concern to the survival of all life and living on the planet. The label "Post-Industrial Age" has given way to labels of this newly emerging era of human endeavor such as "Age of Information" and "Age of Meta-Biological Thinking." These new labels have derived from the practices of those on the growing edges of human culture. Business interests are rapidly adopting the principles of a more wholistic age of meta-biological thinking. Can the schools of North America be more than ten-to-twenty years from the recognition of their time to move on from Industrial Age schooling models?

It is therefore very important that environmental educators be knowledgeable of these paradigm shifts and gently lead their school systems into more wholistic ways of schooling. Educators must not only address the micro issues of delivery but the macro issues of what it is we are teaching, whom it empowers, and how it serves children, teachers, our culture, and the nurturing of a self-sustaining planet.

REFERENCES

Bateson, Gregory. Steps to an Ecology of Mind. New York: Ballentine Books, 1972.

Bateson, Gregory. Mind and Nature: The Necessary Unity. New York: Bantam Books, 1979.

Capra, Fritjof. The Turning Point: Science, Society, and the Rising Culture. New York: Simon and Shuster, 1982.

Capra, Fritjof. The Role of Physics in the Current Change of Paradigms. Address to the Conference on the World View of Contemporary Physics, Colorado State University, 1986.

Hammond, William. Model Strategy for an Effective Environmental Education Program. Washington, DC: U.S. Department of Health, Education, and Welfare, Title III Grant Proposal, 1969.

Jantsch, Erich. The Self-Organizing Universe. New York: Pergamon Press, 1980.

Nicolis, Gregoire, and Ilya Prigogine. Self-equilibrium in Nonequilibrium Systems: From Dissipative Structures to Order through Fluctuations. New York: Wiley, 1977.

Beyond Infusion and Single-Subjects: The Issue of the Fit of Environmental Education in the Curriculum

Ian Robottom

The Victorian Context

My comments are, of course, shaped by the context of my professional work in Australia, and there may be sufficient differences between this and the North American educational contexts to warrant some time spent in outlining the status and context of environmental education in my home state.

Unlike the State of Wisconsin in the United States, Victoria imposes no mandate on teachers requiring them to teach environmental education. In secondary schools, there are enviromental science and environmental studies courses in the pool of courses available to upper secondary students, but these single-subject offerings, while to some extent having set content, are optional. In lower secondary schools, the situation is more opportunistic in terms of environmental education content, with teachers in individual schools determining the nature of environmental educational experiences available to students. There is great variability in amount and content of environmental work.

In elementary schools, there is again no set environmental education curriculum of uniform, systematic environmental education content, though many schools do provide most worthwhile environmental experiences on an opportunistic basis. There are many examples of interdisciplinary general studies courses which have a strong environmental bias. In the elementary setting, it is fair to say that the majority of environmental experiences take place by infusion rather than as separate subjects.

Overall, then, environmental education in the Victorian context does not take a high profile; tends to be optional for students in higher secondary levels, and optional for teachers in lower secondary and elementary levels; is opportunistic rather than systematic; and tends to lack the environmentally and socially critical edge advocated so firmly in documents originating from the Belgrade and Tbilisi conferences of the 1970s.

Any comments relating to appropriate educational responses to this situation need to be made in recognition of recent influential developments in the Victorian education scene. There have been three developments that have been embraced by a number of educational instituions in the state, including some universities, many schools, and (notably) the Victorian Ministry of Education:

--there has been an increased interest in school-based curriculum development and the devolution of decision-making to schools and school councils. Curriculum decision-making has become increasingly the responsibility of schools and the communities of schools.

- --there is increasing advocacy of accountability as a school responsibility, with schools, regions and the Ministry collaborating in support school self-evaluation.
- --there are indications of changes in perceptions of teacher professionalism, with an increasing interest in the idea of practitioner research (teachers-as-researchers and teachers-as-evaluators).

Overall, there is evidence of a shift in the locus of control over education away from central authorities and towards school communities and practicing teachers. These changes are not mere organizational tinkerings; they represent a recognition of, and response to, the implicit power relationships built into hierarchical/technocratic approaches to educational change and professional development. Thus, these changes are relevant in any discussion of efforts at improving environmental education.

My Position on the Issue of Environmental Education as Infusion or Separate Subject

In this symposium we are invited to indicate our position on the issue of environmental education as infusion or single subject. While I recognize the strong philosophical justification of environmental education as diffusion, I believe I have seen more "successful" environmental education provision in the form of separate subjects. By "success" here, I mean in terms of adherence to the critical, politicised prescriptions of environmental education emanating from the UNESCO environmental education program. When infusion is attempted, I have seen many instances of what I could call "solicitous surrender":

> *In Australia, environmental education is not a high-status subject in the school curriculum. Perhaps its political bent renders it unpopular with conservative teachers and school administrations; perhaps its prescribed interdisciplinary character renders it a square peg for the round hole of the conventional discipline-based subject curriculum. Environmental education has continually had to struggle for resources because it is not a high-status subject (it is neither "high-status" nor "subject"--none but its advocates ascribe the former; even its advocates disavow the latter).*
>
> *In its struggle for resources and for legitimacy, environmental education has become vulnerable to the technocratising influences of conventional sources of support. It is open to co-option by academics, medium-level organizations and materials*

> *developers whose professional interests are served by the technocratic interpretation of environmental education--an interpretation which ignores the politicized character of the environmentally- and socially-critical "education for the environment" and stresses the ecologically-oriented and consequently safe and as-you-were "education about the environment"* (Robottom, 1987a).

> *In order to acquire resource support, there are elements of the environmental education movement that are prepared to redefine environmental education, to abandon its critical political edge, and engage in an hegemony with some of the forces that actually threaten the environment...* (Robottom, 1987b).

In my experience, these instances of "solicitous surrender" tend to occur more often when environmental education infusion is attempted. When environmental education is attempted as a separate subject, it is frequently presented as an option, but at least this option is internally authentic and less open to the compromises encountered when efforts are made to infuse it within the structure of "higher-status" established subjects like science.

However, having opted for the single-subject approach, I think the problem of improving environmental education transcends the issue of single-subject versus infusion: I don't believe that the problems of environmental education improvement will be significantly lessened by choosing to pursue either one or the other approach. In my view, the real problem lies in the kind of support offered to teachers as they attempt either form of environmental education improvement. I believe we need to rethink the theory, organization and practice of professional development in environmental education.

Two Broad Approaches to Professional Development and Program Improvement in Environmental Education

The intention in this section is to describe briefly (with the attendant dangers of caricature) what I could call a "standard" approach to professional development and program improvement in environmental education, and contrast this with another way of looking at the problem--one that is based on a different set of assumptions.

In the "standard" approach to professional development and program improvement in environmental education, I believe there is a marked interest in:

--getting the goals right. There is the belief that what is required is a single set of goals accredited by "the academy" (academics, researchers, imminent members of the environmental education community) and expressed as specific learner behaviors and teacher competencies.

--getting the materials right. There is the belief that curriculum materials, if properly researched and developed, can embody universal solutions to effectively teaching the goals referred to above and to implement certain prescribed curriculum materials.

--getting teachers to implement the goals and materials. There is the belief that teachers need to be "sold," persuaded, or coerced to demonstrate the teacher competencies referred to above. For example, in Wisconsin, there is now legislation requiring preservice teachers to "acquire" a certain set of teacher competencies in environmental education.

--getting a measure of goals achievement. There is a belief that instrumental forms of program assessment--those whose main interest lies in determining the extent to which the activities of the program achieve the program's (inherited) goals--is an adequate and appropriate form of evaluation.

When one thinks carefully about the processes involved in this "standard approach" to professional development and program improvement, one can see that its distinguishing characteristic is that of "external control." The goals are set by outsiders, who at times even engage in a struggle to maintain control over the language of the environmental education movement by advancing "their own" goals as the rightful ones, and deprecating the efforts of others to open up debate about what is to count as environmental education. Curriculum materials are typically developed by agents outside schools, and sometimes attempts are made to ascribe a status of "proven effectiveness" to such materials on the basis of these agents' own research, as if materials found to be implemented effectively in one educational/social setting could be expected to elicit identical educational responses in most or all other settings. Further, teachers in some quarters are now forced through legislation to teach environmental education in certain ways determined by university-based and other authorities, and their efforts at responding to these external impulses are measured by outside evaluation experts.

There is a definite hierarchical power relationship built into this approach of professional development in environmental education--one that tends to subordinate teachers in efforts to improve environmental education. The approach embodies an outmoded behaviorist philosophy of learning (evidenced by such phrases as "desired changes in student behavior," "reinforcement of appropriate behaviors" and "strategies need to change human behavior in certain directions"), and a view of teacher professionalism that treats teachers as technicians incapable of theorizing about their own professional work. It also embodies a serious contradiction in terms of the purposes of environmental education.

Teachers are presented with goal statements that embody the environmental and educational values of people outside the context of their own professional work; teacher competency and learner success is defined in terms of these external goals; teachers are "required" to teach environmental education in certain externally-validated ways; if they use externally developed and tested materials that are allegedly "proven effective," any difficulties encountered in particular educational settings can only be explained in terms of teacher incompetence (it can't be the fault of the materials, since university tests have proved their "effectiveness"); the types of tests used to evaluate pupils, teachers, and programs deliberately (in line with an applied-science notion of "objectivity" and rigor of research) avoid engaging the views of practitioners about the idiosyncracies of particular educational/social settings. The outcome of forcibly externalizing the processes of goal formulation, materials development and testing, and program evaluation results in a diminution of the professional role of teachers and in the denial of their own powerful personal values and assumptions and theories about environment and education.

The behaviorist language applied in reference to pupil learning, and the technocratic, hierarchical organization of professional development for teachers, implies a view of teachers and learners as some kind of lower life form responding ("behaving") mindlessly to the selective "reinforcement" of external stimuli applied in sterile controlled conditions. But teaching and learning isn't like that; it involves conscious, rational human beings whose activities are informed by a complex of assumptions, presuppositions, intentions and theories, and takes place in complicated, idiosyncratic and irreproducible social settings. Rather than being regarded as *behaviors that can be determined by external reinforcement*, the activities of teaching and learning need to be regarded as involving *intentional actions*. To do otherwise is to manifest a contradiction: it seems to me to be contradictory to at once espouse the need for enhanced critical thinking about "environment" (on the part of teachers and pupils) *and* to enact approaches to professional development and pupil learning that do not equally encourage critical thinking by teachers and learners. To treat learners as objects whose behaviors simply respond to external stimuli does not encourage those learners to think critically; to adopt technocratic approaches to professional development in the manner outlined above is not consistent with the development of critical thinking in environmental education. Put simply, it is a contradiction to try to coerce critical thinking in rational human beings.

Having made this critique of standard approaches to professional development in environmental education, it is necessary to at least outline an alternative. Perhaps we could begin by changing our assumptions--by acting as if it were likely that:

--goal statement availability is not a problem;

--materials availability is not a problem;

--teacher interest or motivation is not a problem;

--teachers have influential theories and values about environment and education which guide their actions in environmental education; and

--the only way for teachers to address and overcome the problems of environmental education is to conduct their own research into these problems as they arise in their particular settings.

In brief, we would need to create the conditions for teachers to gain more control over their own professional activities, to engage in serious research into their own environmental education activities and thereby to gain a first-hand, authentic understanding of the forms that environmental education problems take in their particular educational settings. Five tentative guidelines are offered here.

1. Professional development in environmental education should be enquiry-based.

   Professional development activities in environmental education should encourage participants at all levels to adopt a research stance to their own environmental education practices. Current practices in environmental education (teaching, curriculum development, inservice activities, teacher education activities, institutional organization...) should be regarded as problematic--as having the potential for improvement through participant research.

2. Professional development in environmental education should be participatory and practice-based.

   Environmental education practices are shaped (guided or constrained) by the theories of practitioners themselves, and by the theories of others built into the structures and relationships of the institutions within which practitioners work. Environmental education problems are matters concerning the practices of individuals and groups: they occur when there are gaps between what practitioners think they are doing and what they are actually doing (these are problems of "false consciousness"); and they occur when there are gaps between what they want to do and what they are actually able to do in their particular settings (these are problems of "institutional pressure"). In either case it is essential that the practitioner be directly involved in addressing these problems, because what is to count as a "solution" will only become clear through a process of working through the relationship of theory and practice. Professional development courses consisting solely of prior "training in the disciplines" conducted outside the work contexts of practitioners are of limited help in resolving these practical problems. Approaches to professional development that impose a division of labor between "practitioners" and "researchers" should be abandoned.

3. Professional development in environmental education should be *critical*.

   Professional development in environmental education should entail critique of the environmental and educational values and assumptions that inform existing environmental educational policies, activities and organizational practices. It is through processes of enlightenment about the values informing and justifying policies, activities and organizational practices that change in these registers is made possible as practitioners come to an understanding of the field through their critical enquiries and develop their own theories about environment and education.

4. Professional development in environmental education should be *community-based*.

   Environmental education problems are doubly idiosyncratic: the *environmental* issues that form the substance of environmental education work are usually specific in terms of time and space (this is simply to say that environmental conditions in different parts of the world are different); and *educational* problems are equally rarely susceptible to universal solutions (this is to say that the ecology of classrooms differs from classroom to classroom).

5. Professional development in environmental education should be *collaborative*.

   There are two reasons for collaborative work in professional development in environmental education. Firstly, recognition of instances of false consciousness or institutional pressure often requires the assistance of colleagues working in similar circumstances (several heads are better than one). And secondly, many of the forces acting against the improvement of environmental education are political in character, and collective action is usually more productive than individual efforts in the context of political struggles.

REFERENCES

Robottom, Ian. *Environmental Education: Practice and Possibility.* Geelong, Victoria, Australia: Deakin University Press, 1987a.

Robottom, Ian. "Environmental Education at a Distance: An Enquiry-Based Course in Teacher Education." Paper presented at the 16th Annual Conference of the North American Association for Environmental Education, Quebec, October 1987b.

The Brain-Mind System and Infusion

Bob Samples

Research on the human brain-mind system indicates that the biological processes of learning are fundamentally governed by neuro-electrical, neuro-magnetic, and neuro-chemical functions. The complexity of these functions is immense and detailed understanding lies far in the future. Certain observations are warranted, however.

For example, there are both "wet" and "dry" models of brain function. The wet model emphasizes neuro-chemistry and the family of neuro-transmitters that relate to secretions of the brain acting as a gland. These have been linked to intelligence, mood or personality, creativity, and learning. The dry model is more traditional in that it emulates the telephone switchboard or the computer. Its focus has been the electrical transmission of impulses along nerve pathways from one point to another. The dry model is basically Newtonian as it is seen as fundamentally mechanical. The wet model is more inclusive, as it is more generalized throughout the brain.

Much of brain research for the past two decades has been dominated by models of functioning that feature the "left-right" model, the vertical or "triune" model, and, more theoretically, the "holographic" or "holonomic" model. Each of these have made partial contributions to understanding of how humans learn. All the models--wet or dry, lateral, vertical, or holonomic--emphasize different attributes of function that help us to envision an ecology of learning in the brain-mind system.

Basically the brain-mind system learns contextually. Context as defined by Gregory Bateson is "pattern through time." Bateson and contemporary brain-mind researchers would insist that we consider both pattern and learning as evolutionary, meaning that we witness continuous change in both the patterns that are explored and the ways in which we experience them. In other words, learning should be recognized as an open-system enterprise. Learning is limited by the imposition of closed-system approaches.

To illustrate, behaviorism, the most popular of this past century's technologies of education and learning, is terminally devoted to closed-system approaches. It requires fixity in information for the stimulus-response model to work. The evolution of information has turned out to be a death blow to behaviorism. The information age and the electronic transmission of that information have created an evolutionary context that is destroying the closed system efficiency of behaviorism. S-R couldn't adapt fast enough to accommodate either S (stimulus) or R (response).

A profound side effect of the very impetus provided by technology is being realized in learning and, in particular, learning in environmental education. This side effect is that more and more of the information being transmitted via the electronic media is information that substitutes for natural experience. In other words, as the brain-mind system is being encouraged by information access to function more congruently with its open system design, we are being coaxed by technology into less experiential modes of education.

Erich Jantsch warned us of this in his book, The Self Organizing Universe. Jantsch indicated that we are being drawn into more continuous and more complex hierarchies of culturally dominated experience in the everyday discourse of life. What this means is that as we live our lives, we are exposed to more and more mediated forms of culturally derived experience. The outcome is a systematically increasing distance between ourselves and nature.

Natural systems are the most fundamentally open systems that we can experience. All cultural experiences are less open than nature. Because environmental education is devoted to both, care must be taken to assure balance.

This brings us back to the design of the brain-mind system. Since the brain-mind is designed as an open system and yet it has invented all the closedness of cultural commitment, then few arenas of study could offer more promise to mediate the relationship between design and disposition than environmental education. Clearly we have the prerogative to fix and specify that which will be taught with the hope that it will be learned. That is, we can create sequences of information and experience in the form of courses of study or programs. We also have the option to place the learning mind in the context of nurturing episodic and experiential involvement that requires the learner to configure the instruction into substantive form. On one hand we honor the universe of mediated experience as organized by our cultural biases and on the other we are exposed to the un-mediated dominion of natural systems where the mind must create reference.

Clearly we must develop grace with both. Neither benefits when the other is ignored. The whole learner is not honored when either is ignored. Organized knowledge, in courses of study and highly regulated experience, can provide significant opportunities for learning at certain times. Less mediated and more open context experience in natural settings can provide powerful growth at other times.

What is important to remember is that regardless which instructional methodologies are used, the brain-mind system will eventually decide which will be infused into learned experience. The brain can only learn by infusion--and infusion is mediated by emotion more than reason.

The fateful outcome of forty years of research dominantly guided by Paul Maclean has been to demonstrate that what has been called "lower" brain functions are in fact in charge of what the brain does in both learning and thinking. Emotional consequences linked to survival mediate any and all messages being provided to the brain in the context of learning and teaching. Thus the design of the brain-mind system requires that we honor the open system nature of the propensity to learn and think. As we intervene through instruction, we must insure a balance between the influences of natural and cultural systems.

It is the cortex that we have become most biased toward in education. Actually, it is the left cortex. With its commitment to what we call rational, logical, analytic thought, the left cortex has displaced the role of the right cortex, the limbic system (the seat of emotion), the brainstem (the seat of basic needs), and the central nervous sytem. Many neuroscientists argue that the left cortex is the organ of culture. It is the mind's mediator between appropriately derived and configured experience and the more holistically tacit functions of the rest of the biological elements of the brain-mind system. The right hemisphere, although more holisitc, is less predictable. It is concerned with the "gestalt" of experience rather than the specificity of it. The right hemisphere processes a reaction to the forest rather than the specific identification to the trees. The limbic and its commitment to emotion is even more suspect as the weight of 8,000 years of Western thought forces us to distrust the emotional in favor of the rational. The brainstem is relegated to animal support functions by those who exaggerate reductive thought.

The real issue here is that the human brain-mind system has evolved so as to include all these functions. We have a biological predisposition to enage in all of these ways of knowing. None is biologically more elevated than another. Biology demands functional equivalence. Assigning status to particular functions is a cultural indulgence.

Environmental education stands at the very heart of these considerations. Politically, we face school systems locked into the archaic recipes of an 18th century vision of the division of experience into content disciplines, and a planet that is screaming its early warnings of death throes to come. Perhaps we in environmental education will overreact. But let us overreact in the name of balance--intentionally honoring culturally organized information and the eternal newness of nature, as we celebrate the brain-mind's design abilities to create knowledge. Let us not indulge in elitism. Let us relinquish ego. Ego is the most malignant of the cultural offerings. It provides the womb of war, sexism, racism, ageism, competition, and all the games of separation. We must excise ego from education and most certainly from education about our planetary home.

Unity, equivalence, harmony, and integrity must become the words that infuse our commitment to environmental education. Nature has given us the realities that allow us to know and infuse these ways of being into our lives. Let us re-think and re-teach these qualities within all of our cultures. Let us strive for the highest possibilities of the evolutionary processes as the course of our chosen destinies. We have already experimented with the baseness of possibility. It is time to embrace balance--time to create a new Eden.

Environmental Education: Larger than a Single Curriculum

Kay Monroe Smith*

Albert Baez (1976) directs consideration of the role of environmental education in the curriculum with his wise definition of the ideal educational experience: "One which provides lifelong motivation to learn generated by scientific curiosity and supported by technical creativity, competence and human compassion." Baez, of course, speaks as a science educator. Listen now to the wisdom of Australian R. D. Linke's (1980) premise on environmental education with a mission, shared at the 1984 NAEE International Conference and in the Journal of Environmental Education:

> *Environmental education is concerned with developing an understanding of the interrelationship between man and his total environment and focuses on the development of concern for the quality of human life and a personal commitment to environmental education being for the environment and supported by studies about the environment.*

According to Baez and Linke, environmental education is indeed larger than life, larger than a single curriculum or a course of studies. Our question, then, becomes not simply how can we include environmental education as a separate or integrated subject in the existing school curriculum, but rather, how can we permeate children's learning experiences with environmental education, a subject so vital it will surely influence the purpose and direction of children's lives as world citizens? Further, what kind of curricular decisions must we make as responsible educators to foster in children, not only an understanding of crucial environmental issues, but especially a profound lifelong committment to wise environmental use and conservation?

Now the challenge of addressing environmental education's place in the curriculum becomes more compelling and challenging. How can we permeate the learning of all children worldwide with opportunities for experiential and attitudal learning about the very world which sustains life and offers hope for tomorrow? How can we make environmental education universally valued, appealing and recognized as a critical area of study for school children of all ages? How can we foster its inclusion in the school curriculum as a separate subject with its own identity, autonomy and support sources? How can we also facilitate its infusion or integration into related curricular areas--science, mathematics, geography, and social science? How can we utilize the teaching of skill development in curricular areas such as reading, writing, speaking, and listening to address environmental education issues?

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*This paper was presented at the October 20 symposium by Diane C. Cantrell, The Ohio State University-Newark.

In this paper, I will use the classic curricular model of Ralph Tyler (1949), the grandfather of curriculum development, to address the question of environmental education's role in the school curriculum. We will use Tyler's four basic questions to assess the state of the art and then to offer questions and recommendations. Tyler's well-respected rationale has served as a basis for much theorizing and curriculum development in the past four decades. His framework is particularly suited to environmental education because it addresses purpose, activities, content and evaluation, thus offering a logical structure for this curriculum with a message. We will also augment Tyler's four-part rationale with other curriculum specialists' input to give our analysis of environmental education greater depth and applicability.

Tyler's rationale is simply stated:

1. What educational purposes should the school (curriculum) seek to attain?
2. How can learning experiences be selected which are likely to be useful in obtaining these objectives?
3. How can learning experiences be organized for effective instruction?
4. How can the effectiveness of learning experiences be evaluated?

Now we will look at the role of the school's environmental education curriculum through the screens of environmental education literature and curriculum paradigms in order to assess its current status and suggest future directions.

Since our question seeks to investigate a rationale for the place of environmental education in the curriculum, we will concentrate on Tyler's first question regarding goals. But we will also substantiate our status report and suggested direction through his three other questions.

Tyler begins by asking, "What educational purposes should the school (curriculum) seek to attain?" Our current question about the role of environmental education in the curriculum is certainly a timely one because a literature review substantiates that role as crucial but not yet clearly defined. Secondly, environmental educators also express concerns about the comprehensiveness of environmental education purpose, goals and objective statements.

Environmental education theorists view environmental education differently than other curricular areas. Kupchella and Hyland (1977) define environmental education as a process, rather than a discipline, by which learners of all ages address their relationship to the environment on a lifelong spectrum. So we must recognize that in scope and purpose, environmental education can't be stuck in a sequestered time slot as some other curricular areas can be.

Nationwide surveys indicate states are only beginning to address the role of this process in their mandated course of study. A 1979 survey of state departments of education indicates that only 58% of the state environmental education programs were judged "fairly well-developed" versus 0% "extremely well-developed" and 27.9% "poorly developed" (Trent, 1983). However, researchers noted a marked increase in both state participation in environmental education program development and the number of schools which offer specific environmental education courses.

Research further shows what format states use to address environmental education objectives through these courses. The vast majority of environmental education programs studied use multidisciplinary or interdisciplinary organization (73.4%), or cross-disciplinary (23.6%), with only 2% reporting a disciplinary orientation (Childress, 1978). Illinois is a case in point. The School Code of Illinois instructs every school to have "instruction, study and discussion of current environmental issues." What curricular organization does the state recommend? The five broad themes for developing and implementing environmental education in all school subjects are presented in the Illinois State Plan for Environmental Education: interdependence, impact, maintenance, quality of life and improvement (Zolewski, 1977). So here we see that state departments are starting to respond to Tyler's call for a purpose in curriculum development by offering multidisciplinary or interdisciplinary studies, perhaps through a multi-faceted themes approach.

While environmental educators are starting to deal with the curricular organization of their discipline, the state of the art for curriculum goals is still developing. There appears to be a dearth of research information providing comprehensive environmental education program descriptions, including goal statements. As a result, some environmental educators feel that curriculum development is proceeding from intuition rather than from well-defined, commonly held curricular goals (Hungerford et al., 1980). They substantiate the need for clearly defined goals. They contend "the responsibilities of environmental education are too great..the time too short..and practitioners' skills too few to allow curriculum development to remain a matter of intuition." Further, Roth's statement (quoted by Hungerford et al., 1980), "the presence of environmental education in the public school curriculum can often be characterized by loose organization and little sense of direction," supports a need for goals. Therefore the multidisciplinary organization needs to be supported by commonly held, expertly articulated goals.

Environmental education experts, therefore, give recommendations for a more direct, less intuitive approach to environmental education goal setting:

1. We need to establish the domain of environmental education.
2. Environmental educators need agreed-upon goals for both curriculum development and instruction.
3. These environmental education goals must be translated into intermediate goals and instructional objectives.
4. Specific objectives should be designed to help students solve environmental problems.

Here we see strong agreement between environmental educators and curriculum specialists. Tyler states that the formation of objectives must be the first step in curriculum development. Experts from both fields suggest direction or content for those objectives. According to Linke and Baez, these objectives must enable learners to have an active, personal commitment to their subject, environmental education, and to the environment itself. Tanner and Tanner (1980) further suggest that these objectives enable learners to address the chief problem of society--not how to organize knowledge, but how to solve problems.

So as environmental educators address the possible role of environmental education as a separate subject or an integrated subject, they must concomittantly address these curricular concerns:

1. Is environmental education best served by the curriculum organization presently in use, a multidisciplinary, interdisciplinary or cross-disciplinary approach?
2. How can we institute a systematic approach to set goals and use these goals to influence state boards of education?

Ralph Tyler's second curriculum question asks: "How can learning experiences be selected which are likely to be useful in attaining these objectives?" We will maintain our environmental education definitions, one set forth by Albert Baez, calling for a lifelong motivation to learn, and one defined by Linke, understanding the interrelationship between man and his total environment, and focusing on both a concern for the quality of life and a personal commitment to environmental conservation.

Let's now look at how the multidisciplinary curriculum model organizes experiences to meet curriculum experts' standards of excellence. Elliot Eisner (1985), in his creative approach to curriculum development, The Educational Imagination, calls for artistry in constructing curricular experiences and artistry in teaching. He suggests that real learning requires a learner to be active and construct meaningful patterns out of experience. Thus, Eisner sees students as architects of their own learning. Miller (1981) directs educators to plan experiences which will develop students' thinking. Fantini (quoted by Eisner, 1981), a humanistic curriculum theorist, carries these contentions a step further by calling for curriculum experiences which are attuned to concerns of the learner and responsive to both affective and cognitive needs. Taba (1962), elaborating on Tyler's rationale, suggests that these principles can best be realized when teachers or practitioners, the real curriculum users, are also the curriculum developers.

How does the present day multidisciplinary environmental education curriculum respond to these humanistic guidelines? Current environmental education learning experiences can be described by a set of environmental education characteristics compiled by Hart (1981). After assessing environmental education conferences and articles, Hart presented these environmental education characteristics, among others, to facilitate an understanding of this young field: interdisciplinary, concept development, process development and active participation. The current multidisciplinary orientation seems to correspond to Hart's characteristics. Proponents of this organization contend that environmental education should be part of every subject taught and concept development should enhance thinking skills. Further, the process development characteristic, defined by Hart, suggests the cognitive, affective and skill development processes seen in the multidisciplinary approach.

Cohen (1981) also accepts the curricular challenge for teaching thinking through real life concerns of the learner. He proposes problem-solving activities in energy and environmental education to improve current solutions, solve unanticipated problems and create new knowledge. Further, Alan Miller (1981) supports curriculum theorists' case for offering thinking skills and learning experiences by proposing integrative thinking as a goal for environmental education. He calls for a change from "reductionistic," "compartmentalized" thinking to a concern for synthesis, participation and interconnectedness to address environmental concerns.

Thus, while it seems that environmental educators are still articulating the goals and objectives for the multidisciplinary approach they seem to prefer, they are already supporting learning experiences which stress concept development, integrative thinking, process learning and problem solving.

Next Tyler (1949) asks, "How can learning experiences be organized for effective instruction?" We have noted the preference for a multidisciplinary curriculum framework. Now let's assess the appropriateness and effectiveness of this curriculum framework for environmental education.

Childress' (1978) nationwide survey indicated that 97% of environmental educators polled favored some form of a multidisciplinary curriculum organization. An obvious advantage of this approach is to utilize existing subject areas, including biology, geology, geography, mathematics and history. Lesser used but applicable subjects include political science, fine arts and physical education. This integrated approach seems congruent with Linke's (1980) definition of environmental education as education about the environment, education for the environment and education in the environment.

Curriculum theorists also validate the multidisciplinary organization. Tanner and Tanner (1980) discuss the goals of interdisciplinarity: synthesis, understanding, shared process of inquiry, a need to rehumanize learning and greater relevancy. Taba (1962) defines integration in curriculum as a horizontal relationship of various curricular areas and also a cognitive change that happens in the individual learner. Benjamin Bloom (quoted by Taba, 1962) contends: "an integrated curriculum gives learners the opportunity to see relationships between experiences and knowledge, and compare and contrast experiences which would otherwise be unrelated".

Tanner and Tanner (1980) further suggest that the need to solve our pervading social problems requires a reconstruction of the curriculum so the interrelationships of knowledge can be revealed. An interdisciplinary curriculum organization, therefore, emphasizes the interrelationship of these components: 1) the nature and interest of the learner, 2) the problems of society, 3) the interdependence of knowledge, and 4) the involvement of the whole school community. Thus the definitions of environmental education cited earlier seem to be well suited to the multidisciplinary curriculum organization currently used. Multidisciplinary seems to offer the opportunity for synthesis, problem solving, and relationship formation that environmental education require.

Finally, Tyler (1949) asks, "How can the effectiveness of learning experiences be evaluated?" While the multidisciplinary approach has been adopted by many environmental educators, they need to consider curriculum evaluation principles to assess their goals, learning experiences and curricular organization. They would do well to attend to some classic curriculum evaluation strategies summarized by Miller and Teller (1980) so they can consciously evaluate their environmental education curriculums:

1. Scriven suggests combining formative evaluation for program revision with summative evaluation for program assessment.

2. Cronbach sees curriculum evaluation as a component in decision making for program improvement.

3. Revision of the existing curriculum is the primary evaluation objective noted by Elliot Eisner.

4. Cronbach further differentiates between a scientific evaluation approach using experiments and a humanistic approach using naturalistic case studies.

5. Both Stake and Scriven contend that evaluation must be part of decision-making and the evaluation will only be complete when the decision is made.

Evaluation experts suggest that curriculum developers use a variety of evaluation approaches. Environmental educators need to continue their research into the environmental education curriculum approaches being used nationwide via evaluation. Curriculum evaluation experts provide the needed direction and guidance for both this program evaluation and assessment. Further, the Tyler rationale provides a clear, logical framework to assess the state of the art nationally, statewide, and locally.

As Hart (1981) has indicated, environmental education can be characterized as a field or discipline by analyzing professional meeting proceedings and journal articles. These proceedings and articles include thoughtful, scholarly and profound definitions, and purpose statements for the field of environmental education.

Environmental educators must begin their quest for an appropriate environmental education curriculum organization with agreed upon definitions, purpose statements and related goals. These goals then can be used as a basis to evaluate the existing multidisciplinary curriculum in use or to propose alternative models. Curriculum theory abounds with tested methods to make such evaluation both comprehensive and productive.

A review of the professional literature in both environmental education and curriculum development reveals that these two fields have much to contribute to each other. Environmental educators are sophisticated, often multi-trained and multi-talented educators who bring creativity and professionalism to their field. This excellence is evidenced by the human behavior and attitudinal changes they foster. As they systematize their curriculum planning, implementing and evaluating procedures, they will further strengthen the efficacy of their environmental education curriculum--a process and product which enhances the quality of life on earth.

REFERENCES

Baez, Albert V. Innovation in Science Education--Worldwide. Paris: UNESCO, 1976.

Childress, Ronald B. "Public School Environmental Education Curricula: A National Profile." Journal of Environmental Education, 9(3), 2-11, 1978.

Cohen, Michael. "Problem Solving as a Goal of Energy and Environmental Education." Journal of Environmental Education, 13(1), 17-21, 1981.

Eisner, Elliot W. *The Educational Imagination*. New York: Macmillan Publishing Company, 1985.

Goldstein, Beth V., and Linda G. Lockwood. "Experimental Education: Ahead to Basics." *Journal of Environmental Education*, 12(1), 24-28, 1980.

Hart, E. P. "Identification of Key Characteristics of Environmental Education." *Journal of Environmental Education*, 13(1), 12-16, 1981.

Hungerford, Harold R., R. Ben Peyton, and Richard J. Wilke. "Goals for Curriculum Development in Environmental Education." *Journal of Environmental Education*, 11(3), 42-47, 1980.

Kupchella, Charles E., and Margaret C. Hyland. "Essential Curriculum Components in Environmental Education." *Journal of Environmental Education*, 8(3), 11-16, 1977.

Linke, Russell D. "Achievements and Aspirations in Australian Environmental Education." *Journal of Environmental Education*, 12(2), 20-23, 1980.

Linke, Russell D. *Environmental Education in Australia*. Sydney, Australia: Allen and Unwin, 1980.

Linke, Russell D. "The Challenge of Environmental Education in Today's World." In: *International Perspectives on Environmental Education: Issues and Actions, Proceedings of the 13th Annual Conference of the North American Association for Environmental Education*, Banff, Dorothy A. Cox and William B. Stapp (eds.), 32-37. Troy, OH: NAEE, 1984. ED 267 969.

Lucas, A. M. "The Role of Science Education in Education for the Environment." *Journal of Environmental Education*, 12(2), 33-37, 1981.

Miller, Alan. "Integrative Thinking as a Goal of Environmental Education." *Journal of Environmental Education*, 12(4), 3-8, 1981.

Miller, John P., and Wayne Teller. *Curriculum Perspectives and Practice*. New York: Longman, 1985.

Taba, Hilda. *Curriculum Development: Theory and Practice*. New York: Harcourt, Brace and World, 1962.

Tanner, Daniel, and Laurel N. Tanner. *Curriculum Development: Theory into Practice*. New York: Macmillan, 1980.

Trent, John H. "Environmental Education in Our Schools during the 1970s." *Journal of Environmental Education*, 15(1), 11-16, 1983.

Tyler, Ralph W. *Basic Principles of Curriculum and Instruction*. Chicago: University of Chicago Press, 1949.

Zalewski, Leon J. "The Illinois State Plan for Environmental Education and Energy Conservation." *Journal of Environmental Education*, 8(3), 7-10, 1977.

Environmental Education in the School Curriculum: Does It Fit?

Jerry Hodge*

Does It Fit?

Philosophical Implications

The question posed in this symposium appears to be a simple one but it is more complex than I had imagined when I sat down to write about it. My immediate bias was to suggest that an integrated approach to anything is better than one which deals with only parts of it in sequence but I was hard-pressed to provide support for that view other than an intuitive one. So in the context of justification rather than in the context of discovery I began to gather evidence to support integration. It was not hard to find.

Practice in environmental education should be consistent with the philosophical dimensions of how we understand the environment. Aristotle, Aquinas and Descartes form one pole of the argument, all supporting the notion that there are two separate entities in the universe--mind and material, that only humans have mind and thereby they have dominion over all other material aspects of the environment (Rifkin, 1984). The other pole can be attributed to positions taken by Whitehead, Bateson, Lovejoy (Evernden, 1985) and others which draw "Mind and Nature" (Bateson, 1980) into a synthesis, using either the long-term memory of evolution or energy relationships over time as a unifying force.

If one accepts the Cartesian duality model then I believe a sequential, fragmented, scientific approach to environmental education is fine. Man is neatly separated from his environment. He is expected to act as a steward to protect parts of the known environment against undue damage, but somehow sees himself as above it all, protecting a valuable resource.

If the second model is accepted, then Man is part of the planet's systems. He, along with all other organisms, matter and forces, has innate responsibility for maintaining the systems. Energy and genes flowing through his body are temporal phenomena, things that are happening now. Sometime later the energy, like the energy in a wave, will be elsewhere and the genes will be in descendants. The second model provides a sense of context as well as content. The material "stuff" of the universe acts in a context of space, time and energy interrelationships. Looking at the "matter" world is looking at only part of the whole.

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Science and Environmental Education

There is a continued, almost unshakable, belief that the elements of good environmental education either are or are not parallel to science education. But whereas science is uncovering what "is," environmental education has as its prime motivating force what "ought" to be (Worster, 1975).

A new book by Neil Evernden, The Natural Alien (1985), makes this viewpoint even stronger. He makes a distinction between two modes of perception, detail-perception and meaning-perception, as providing us with our view of the world. Detail-perception provides us with the detailed environmental stimuli of actual things whereas meaning-perception provides us with holistic, conceptual and often intuitive perceptions from and about the environment.

In Evernden's book, Colin Wilson is quoted to suggest an analogy (pg. 106):

> *Man is in the position of a painter painting a gigantic canvas. If he stands close enough to be able to work, he is too close to see it as a whole. If he stands back to see it as a whole, he is too far away to use his paintbrush.*

Evernden's point is that science carefully paints in the details of the environment but cannot stand back from the environmental canvas to see the whole because looking at the environment that way is unscientific. Meaning-perception is too subjective to be useful in science. With respect to environmental issues, using detail-perception is often an excuse for inaction.

Does It Fit?

It is the intellectual environment I have just described which is the milieu we face in developing strategies for inculcating the goal of environmental education developed in the Belgrade Charter in 1975. I am sure that definition needs no introduction here, but the objectives that followed the definition provide an organizing principle for an answer to the question, "Does Environmental Education Fit into the Curriculum?"

The objectives of a good environmental education program, according to the Belgrade Charter, are the development of awareness, knowledge, attitudes, skills, critical thinking, and participation. Several of these objectives add an ethical dimension to environmental education which steps beyond environmental science. Objectives such as attitudes, skills, critical thinking and participation move the environmental education of young people into areas of morality and social action.

In a public school system, values and ethics force what is generally referred to as "balance" in the curriculum. Opposing viewpoints, critical thinking, discussion, debate, open-ended argument and controversial issues are some of the terms used to describe a very ragged process of dialogue for arriving at the "truth" in a way that is considered fair and uncontroversial outside the classroom. That truth is, of course, as good as the quality of the knowledge, preparation and awareness that goes into the classroom process and what the student and the teacher bring to the process from value sets developed elsewhere.

While the process of dealing with controversial issues is tricky, the spirit of inquiry developed over the long term is an invaluable service to a student. The Project WILD and Project Learning Tree materials are good examples of curricula that deal with sensitive issues in a balanced way. Elementary teachers in Toronto are asking for the Canadianized version of the Project WILD program in large numbers. We have supplemented the material in our workshops with order forms for the Humane Guide to Protect WILD published by the American Humane Society to lend support to the controversial nature of environmental issues. Our Board has even produced a policy paper in dealing with controversial issues in the classroom. That document can provide support for environmental issues teaching, although it was designed to provide academic freedom to teachers and provide a process for complaint from parents. In this large urban board, support is available for the teacher to approach controversial material responsibly in the classroom without fear of censorship.

In order to be philosophically consistent teachers who accept as true the more holistic philosophy should provide learning materials to students which involve development of attitudes, skills, critical thinking and participation in environmental issues as a necessary consequence of their thinking.

Gregory Bateson (1987) puts it this way:

> *The beautiful and the ugly, the literal and the metaphoric, the sane and the unsane, the humourous and the serious...all these and even love and hate are matters that science presently avoids. But in a few years, when the split between problems of mind and problems of matter ceases to be a central determinant of what is impossible to think about, they will become accessible to formal thought...My colleagues and I are still incapable of investigating such delicate matters.*

As one final thought about perceptions, I think a reading of the last few pages of Worster's Nature's Economy is worthwhile. In the spirit of controversy and balance I leave you with his thought about science and ecology:

> *For all its shortcomings, science--precisely because of this internal diversity of outlook--has contributed more than any other discipline to expanding man's vision of the natural world.*

How Does It Fit?

Costs

The Toronto Island School, Boyne River Natural Science School, and the Toronto Urban Studies Centre supported by the Toronto Board of Education cost Toronto taxpayers more than 2.5 million dollars (2 million U.S.) per year in property taxes to maintain out of a total school budget of approximately 550 million dollars (440 million U.S.). In addition to that cost, the Board rents space in nearby residential conservation centers. On the average students in the Toronto system spend 2.3 weeks during their schooling at a residential school in programs related to environmental education. The cost is approximately 130 dollars per student per day (100 U.S.).

Such a commitment to environmental education is unusual, I think, at the elementary and secondary level for a school board and has been the consequence of a few people strongly committed to it continually applying pressure to improve and expand facilities and services over a 30 year period.

Motivating Students

The staff of the Boyne River School have developed four major areas in which students can involve themselves actively with their environment:

> Enjoyment is a strong motivating force and can act as a source of attraction for active involvement in environmental issues.
>
> Knowledge about the environment is the usual Cartesian way of dealing with the environment. For some students, knowledge provides a strong motivating force.
>
> Aesthetics can provide opportunities for developing pleasant relationships with the natural environment. Drawing, painting, poetry, and simple observation are motivators.
>
> Encounter can be direct physical challenge or social action about an environmental issue.

Teaching Methods

Environmental educators have recently found themselves using very modern, "newly discovered," methods for educating children. These techniques, used for years in environmental education, are new significant teaching strategies in other disciplines. For instance, Cooperative Education techniques (strategies for group work) reflect the normal way outdoor educators have operated for years. Recent curriculum guides from the Ontario Ministry of Education stress activity-centered learning as a component of all courses. Values and attitudes education are receiving more attention in elementary school curriculum documents. I have already mentioned controversial issues teaching. The four areas of involvement used to develop Boyne River programs mentioned above appear to recognize different learning styles for different childen.

All of these factors lead me to answer the question "How Does It Fit?" by suggesting an integrated approach to environmental education. Even in the science classroom, teachers engage in the unscientific approaches described above. Often, we call it science, but we teach and investigate many different disciplines and skills. Clearly then, environmental education can claim the same integration of disciplines and skills.

Stages of Development of Environmental Appreciation

STAGE 1. What You Don't Know About, You Can't Care About. (Exposure)

The first task is to expose children to rural environment. The Board has mandated that all children in grades 5 or 6 will spend one week at a residential field center. The exposure there is to provide hands-on opportunities for students to do nature study and skill development in the out-of-doors. In some cases that week is the first away from their family, the first overnight in a rural setting and the first environmental education experience outside of a classroom. Fear is an attitude--a safe, secure environment in the wilderness is very important in wanting to protect it.

In the classroom during the middle elementary period there needs to be exposure to some of the principles of ecological relationships. Project WILD is ideal because it is experiential, ecological and often out-of-doors. About twice a year we offer a Project WILD workshop in the city to teachers who bring their students to our center. Fitted into their regular program, Project WILD is a hit with teachers and students. Because it is applicable to many subject disciplines it is not seen by teachers as merely a science-related activity. Separating environmental education from science at this level is a positive effect in my view. Dovetailed with learning theory developments which make activity an important part of the learning experience, Project WILD activities illustrate the value of activity-based learning.

In our jurisdiction, developments with similar programs like Project Learning Tree and the SEEDS program are slow but there is a movement to add these programs to the repetoire of our elementary teachers. Many seem willing.

STAGE 2: Building Skills and Appreciation (Engagement)

The second visit to a residential center usually happens in grade 7 or 8. Middle school children are active and experimental. We can provide them with outlets for their enthusiasm by engaging them in outdoor pursuits that a) motivate them, b) provide understanding about the environment, c) involve them in direct application of their new knowledge and d) engage them in action by asking them to examine and make suggestions about particular environmental issues.

I think it is important at this age to capitalize on new-found physical capabilities in the field center setting so that hiking, skiing, camping, climbing and caving are used to develop the encounter aspects of involvement in a secure way. Adults will often relate to the environment that way.

The Boyne offers a week in track and field, instrumental music, vocal music, art and multiculturalism to students in city schools as an irregular part of our program because it provides ways that motivated students can relate to the out-of-doors from a base that interests them. In each of these programs there are segments of environmental education teaching built into the program. It has become a way of using aesthetics as an area of involvement.

TASK 3: Ecology (Commitment)

The secondary student provides the greatest challenge to environmental education teaching. The fragmentation imposed by subject specializations in high school provides difficult ground for infusion. For example, this year our jurisdiction is able to offer five environmental science courses in the high school curriculum as options to more traditional science courses. By their very nature these courses fit the Cartesian model of science education rather than the more holistic model described above, which I feel is more suitable for environmental education.

The art of the possible suggests that we begin to bring students in these courses to field centers and to make sure the objectives of the Belgrade Charter are found in those environmental science courses. But we should also be recommending to colleagues in other subject disciplines that ecological issues teaching can fit into geography, history, English, music, art and languages programs as issue-oriented material. The challenge of fitting the philosophy to program is great in this age group because of the way secondary schools are structured, but I think the pay-off is also the greatest if environmental education is on everyone's mind, not just in the mind of the science teacher. We all have a great stake in it.

A Final Consideration

Finally, the needs of your particular community must be considered as part of the question of "How Does It Fit?" For example, in our jurisdiction a high priority was placed on the need for residential centers away from the city. Ontario is blessed with a multilingual and multiethnic population. Toronto, in particular, is a catchment area for worldwide immigration, collecting families from many difficult situations in the world. A strong educational effort has been made to integrate immigrants linguistically and yet encourage diverse cultural heritages to be retained as a part of the social fabric. The immigrant population is largely an urban population centered in Toronto which uses the public school system for their children's education.

Within that context, environmental education remains a low priority for immigrant parents who are more concerned with meeting the physical needs of their families and establishing a platform for family development in the second generation. The roots of environmental education were sequestered in the third and fourth generation families. This group, who have traditionally taken advantage of "cottage country," place a high priority on environmental protection in areas in which they relax and have transported their values back to urban areas at the end of the summer. It was seen as necessary by this group to develop a strong environmental ethic in the children of parents who did not see environmental concerns as a high priority. Residential centers were developed to bring the children to the natural environment in a secure and involving way.

Conclusions

In my view, as an ultimate goal environmental education should be woven into the curriculum of many subjects at all levels.

The fragmented high school curriculum makes integration of environmental education difficult.

The objectives of the Belgrade Charter form a good base for developing program and go beyond teaching environmental science as a distinct program.

How environmental education fits in your jurisdiction should reflect the specific needs of your community.

Different teaching strategies should be employed for different age groups.

Most environmental educators have many very modern teaching strategies as a natural consequence of working in this area.

A sequence of intense experiences over a number of years, even if each experience is short, can provide strong motivation for students.

Knowledge, enjoyment, aesthetics, and encounter can be motivating forces for students and should be considered when designing program objectives.

REFERENCES

Bateson, G. Mind and Nature. Toronto: Bantam Books, 1980.

Bateson, G., and M. Bateson. Angels Fear. New York: Macmillan, 1987.

Belgrade Workshop on Environmental Education. Trends in Environmental Education. Paris: UNESCO, 1975.

Evernden, N. The Natural Alien. Toronto: University of Toronto Press, 1985.

Worster, Donald. Nature's Economy. New York: Doubleday, 1975.

THE SURVEY

SURVEY REPORT

CURRENT PRACTICE: ENVIRONMENTAL EDUCATION IN U.S. SCHOOL CURRICULA

John F. Disinger

The practical problem of finding ways to incorporate environmental topics within K-12 school curricula is a continuing one. Because neither environmental education nor any of its concomitants has traditionally had a curricular home of its own, those wishing to promote inclusion of environmental considerations have been faced with the necessity of identifying benign niches in existing curricular environments. Doing so presents the same challenges for those interested in emphasis on environment as it does for others promoting the inclusion of other non-traditional topics in school curricula.

One might expect that public support for environmental protection, currently at high levels approximating those of the early 1970's (Dunlap, 1987), would lead to insistence, on a national level, that public education make concerted efforts to mirror those concerns in the classroom. Available evidence suggests that such is not the case, in much the same manner that documented public concern for environmental quality has not resulted in consistent pro-environmental action at national levels. McCloskey (1987) has suggested that environment is politically a "second-order issue," which does not receive major attention nationally in the sense that economic and national security issues do. At the same time, Udall (1987) has indicated that the place to look for--and find--environmental concern in the political arena is at the state and local levels, "where voters are presented with clear-cut choices." Commoner (1987) has concisely summarized the evolution of the environmental movement of the past two decades with similar observations.

The study reported here is based on acceptance of the assumption that environmental topics demand inclusion in K-12 curricula at meaningful levels. It seeks to determine to what extent environment-related concerns are reflected in K-12 curricula, which "types" of environmental education are commonly practiced, and ways in which "environment" is included--separate subjects, infusion, or otherwise.

During 1987, the ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/SMEAC) conducted a survey of the state education agencies, asking respondents--individuals with responsibility for environmental education within the agency--to summarize their perceptions as to how schools include environmental topics in their curricula by responding to a series of questions developed to elicit such information. Also requested was information concerning extent of inclusion, forms of environmental education commonly employed, and agency policy with respect to inclusion. The rationale for using this strategy to seek this information is based on the Constitutional responsibility of the states for leadership in formal education. This effort was complementary to, but not interdependent with, the staging of the symposium reported earlier in this volume.

Since the early 1970's, ERIC/SMEAC has periodically surveyed the state education agencies for status information dealing with environmental education. Some of these efforts have been reported in the journal literature, while others have been disseminated solely through ERIC/SMEAC Information Reports, Bulletins, and Digests. Among those reports developed in cooperation with representatives of the state education agencies have been five Directories of Projects and Programs in Environmental Education (Disinger, 1972; Disinger and Lee, 1973; Disinger, 1975; Disinger, 1976; Disinger, 1979), a State-by-State Report (Disinger and Bowman, 1975), a journal paper summarizing the status of state-level activity in environmental education (Disinger and Bousquet, 1982), and a survey of Current Practices in Science/Society/Technology/Environment Education (Disinger, 1986).

Format of the Current Survey

Responses were received from representatives of 40 of the 50 state education agencies (80%). Parallel sets of questions were directed toward practice in environmental education and/or environmental topics in elementary schools and in secondary schools. An additional question dealt with agency policy with respect to inclusion of environmental topics.

Elementary Schools

Table 1 summarizes responses to the question, "To what extent is environmental education included in the curricula of elementary schools in your state?" Response was requested in terms of percentages of schools including environmental education in some manner, with five suggested response categories: 0-20%, 21-40%, 41-60%, 61-80%, and 81-100%. Of the 38 responses to this question, 17 (44.7%) indicated the highest percentages, while the others were distributed more or less evenly across the remainder of the spectrum of possible responses. Of them, six (15.8%) indicated the lowest frequencies. Nine respondents (22.5%) indicated that their responses were based on data, while the remainder either indicated use of estimates or did not respond to the question. Those indicating data-based responses frequently cited state-level requirements for inclusion of environmental topics as evidence that they were in fact included and did not cite direct evidence of actual inclusion.

TABLE 1

Inclusion of EE in Elementary Schools

	0-20%	21-40%	41-60%	61-80%	81-100%	Data?	Separate	Infused	In:
Alaska					X			X	local st, native st
Arkansas					X	X		X	sci
California					X		X	X	
Delaware	X					X	X	X	
Florida					X			X	
Georgia	(No response to this question)							X	sci, soc st
Hawaii		X						X	
Idaho				X				X	
Illinois					X			X	
Indiana		X						X	
Iowa		X						X	
Kansas	X							X	
Kentucky	X							X	
Louisiana		X						X	
Maine	X							X	
Maryland					X			X	sci, lang arts
Massachusetts			X					X	
Michigan	(No response to this question)						X	X	
Minnesota					X	X		X	
Mississippi					X			X	
Missouri					X	X	X	X	
Montana				X				X	
Nebraska				X				X	
Nevada					X		X		
New Hampshire					X	X		X	
New Mexico		X						X	
New York		X						X	
North Carolina					X			X	
North Dakota			X					X	
Ohio					X			X	
Pennsylvania					X	X		X	
South Dakota			X					X	
Tennessee	X							X	
Texas					X	X		X	sci
Utah	X							X	
Vermont		X						X	sci
Virginia					X	X		X	sci, soc st, lang arts
Washington				X		X		X	
Wisconsin					X			X	
Wyoming				X				X	
TOTALS	6	7	3	5	17	9	5	39	
PERCENTAGES	15.8	18.4	7.9	13.2	44.7	22.5	12.5	97.5	
			(N = 38 States)				(N = 40 States)		

Only one respondent (2.5%) noted that environmental education was most commonly considered a separate subject in the elementary schools of the state for which he was responding. Infusion of environmental topics into other curricular areas was noted as a common practice in 39 of the 40 responding states (97.5%); four of those states also indicated that environment was treated as a separate subject on occasion. Thus, in five states (12.5%) environmental education was treated as a separate subject frequently enough to warrant mention.

Table 2 summarizes responses to a question inquiring as to forms of environmental education commonly employed in elementary schools. Nature study was cited by 33 of 39 respondents (84.6%). Energy education (by 69.2%), outdoor education (by 66.7%), and conservation education (by 66.7%) also were frequently noted. Relatively fewer respondents noted emphasis on marine/aquatic education (41.0%), while emphasis on either science/society/technology/environment education (20.5%) or on population education (17.9%) was still less common.

Secondary Schools

Table 3 summarizes responses to the question, "To what extent is environmental education included in the curricula of secondary schools in your state?" Response was requested in terms of percentages of schools including environmental education in some manner, with five listed response categories: 0-20%, 21-40%, 41-60%, 61-80%, and 81-100%. Of the 38 responses to this question, 18 (47.4%) indicated the two highest percentages, while 18 others (47.4%) noted the two lowest percentages. Only 9 (22.5%) of the 40 responding to the question of basis of this information indicated that data had been used; the others either indicated use of estimates or did not respond to the question.

Infusion of environmental topics into other curricular areas was noted as a prevalent mechanism of inclusion in secondary schools by 36 of the 40 respondents (90.0%) to the questionnaire item dealing with format of presentation. Eleven (27.5%) indicated that presentation as a separate subject was a common practice. Thus, 7 (17.5%) indicated that both "infusion" and "separate subject" were common practices in the secondary schools of their states.

Of the 36 who mentioned infusion as a common practice, 28 (77.8%) specified science or biology as at least one of the curricular areas in which environmental topics were infused; of them, 16 (57.1%) indicated only science or biology. Nine of the 36 (25.0%) specified social studies as a subject area into which environmental topics were infused; each of those nine also noted science as a host subject. In two cases (Ohio and Wisconsin), a number of curricular areas were noted as hosts. Alaska studies was identified as a host area in that state's secondary schools, and a science/technology/society curriculum by the Utah respondent. Seven states indicated infusion as the typical practice but did not identify host subjects.

TABLE 2

Common Forms of EE in Elementary Schools
(N = 39 States)

	Nature Study	Outdoor Education	Conservation Education	Population Education	Energy Education	Marine/ Aquatic	SSTE Education
Alaska	X	X	X			X	
Arkansas	X		X		X		
California	X	X	X	X	X	X	
Delaware	X				X	X	
Florida	X	X			X	X	
Hawaii	X	X	X	X	X	X	X
Idaho		X			X		X
Illinois			X				
Indiana	X	X	X		X		
Iowa	X	X	X		X		
Kansas	X		X				
Kentucky	X				X		
Louisiana	X						
Maine	X	X	X		X	X	
Maryland	X	X	X				
Massachusetts	X	X	X		X	X	X
Michigan	X	X			X		
Minnesota	X		X		X	X	
Mississippi	X	X			X		
Missouri	X	X	X		X	X	X
Montana	X	X	X		X		X
Nebraska	X	X	X		X	X	
Nevada	X		X				
New Hampshire	X	X	X	X		X	X
New Mexico		X					
New York	X	X	X				
North Carolina	X	X			X	X	
North Dakota			X				
Ohio	X	X	X		X	X	X
Pennsylvania	X		X		X		
South Dakota	X				X		
Tennessee	X						
Texas	X		X	X	X	X	
Utah		X					
Vermont	X	X			X		
Virginia	X	X	X	X	X	X	X
Washington	X	X	X		X		
Wisconsin	X	X	X	X	X	X	
Wyoming		X	X	X	X		
TOTALS	33	26	26	7	27	16	8
PERCENTAGES	84.6	66.7	66.7	17.9	69.2	41.0	20.5

TABLE 3

Inclusion of EE in Secondary Schools

	0- 20%	21- 40%	41- 60%	61- 80%	81- 100%	Data?	Separate	Infused	In:
Alaska				X				X	sci, Alaska st
Arkansas					X	X		X	sci
California					X			X	sci, soc st
Delaware	X					X	X	X	
Florida					X		X	X	sci
Georgia	(No response to this question)							X	sci, soc st
Hawaii	X						X		
Idaho		X						X	
Illinois					X		X		
Indiana		X					X	X	
Iowa				X			X	X	sci
Kansas	X							X	sci
Kentucky	X							X	sci
Louisiana		X				X		X	sci
Maine	X							X	biol
Maryland					X			X	sci, soc st
Massachusetts		X					X		
Michigan	(No response to this question)						X	X	sci
Minnesota		X				X	X		
Mississippi					X			X	biol
Missouri					X	X		X	
Montana		X						X	
Nebraska			X					X	biol
Nevada					X			X	sci
New Hampshire				X				X	
New Mexico	X							X	sci, soc st
New York		X						X	sci, soc st
North Carolina				X				X	sci
North Dakota		X						X	
Ohio					X		X	X	many subjects
Pennsylvania				X		X		X	sci
South Dakota		X						X	biol
Tennessee		X						X	sci, soc st
Texas					X	X	X	X	sci
Utah	X							X	sci, STS
Vermont	X							X	sci
Virginia					X	X		X	sci, soc st
Washington				X		X		X	sci, soc st, lang arts
Wisconsin					X			X	sci, soc st,agr,tech ed
Wyoming			X					X	
TOTALS	8	10	2	6	12	9	11	36	
PERCENTAGES	21.1	26.3	5.3	15.8	31.6	22.5	27.5	90.0	
	(N = 38 States)					(N = 40 States)			

TABLE 4

Common Forms of EE in Secondary Schools
(N = 39 States)

	Nature Study	Outdoor Education	Conservation Education	Population Education	Energy Education	Marine/ Aquatic	SSTE Education
Alaska	X	X	X		X	X	X
Arkansas	X		X		X		X
California	X		X	X	X	X	
Delaware							X
Florida		X			X	X	X
Hawaii	X	X	X	X	X	X	X
Idaho		X			X		X
Illinois			X				
Indiana		X	X		X		X
Iowa			X	X	X		X
Kansas	X	X			X		
Kentucky	X				X	X	X
Louisiana			X	X	X	X	X
Maine			X		X	X	X
Maryland			X	X	X	X	X
Massachusetts		X			X		
Michigan	X		X	X	X		X
Minnesota		X		X	X		X
Mississippi			X	X		X	X
Missouri	X	X	X	X	X	X	X
Montana		X	X		X		X
Nebraska	X	X	X	X	X	X	X
Nevada	X		X				
New Hampshire				X	X	X	X
New Mexico							X
New York			X	X	X	X	X
North Carolina		X			X	X	X
North Dakota					X		
Ohio	X	X	X		X	X	X
Pennsylvania			X	X	X	X	X
South Dakota					X		X
Tennessee	X						
Texas	X	X				X	X
Utah		X					X
Vermont	X	X			X		
Virginia	X	X	X	X	X	X	X
Washington				X	X	X	X
Wisconsin			X	X	X	X	X
Wyoming				X	X		X
TOTALS	15	17	21	17	31	20	31
PERCENTAGES	38.5	43.6	53.8	43.6	79.5	51.3	79.5

As indicated by Table 4, the two most common forms of environmental education identified in secondary schools were energy education (by 31 of 39 respondents, or 79.5%) and science/society/technology/environment education (by 31 of 39 respondents, or 79.5%). Conservation education was noted by 21 respondents (53.8%), and marine/aquatic education by 20 (51.3%). Outdoor education and population education were each noted by 17 respondents (43.6%). Fifteen (38.5%) indicated that nature study was a common emphasis in the secondary schools of their states.

One state (Pennsylvania) reported a requirement of an environmental course of all high school students, while three others (Indiana, New York, and Washington) noted a mandate for the availability, as electives, of environmental courses in secondary schools.

Comparisons between Elementary and Secondary Schools

In both elementary and secondary schools, reported percentages of inclusion of environmental topics in curricula are bi-modal; that is, in neither situation are the reported percentages clustered in the middle (Table 5). The reported percentages suggest that environmental education is relatively more common in elementary schools than in secondary schools, with 57.9% of the states reporting elementary schools as being in the 61%-plus category, as compared to 47.4% of the states reporting similar percentages for secondary schools.

TABLE 5

Inclusion of Environmental Topics in School Curricula, for Elementary and Secondary Schools (N = 38 States responding)

	Elementary Schools		Secondary Schools	
	Number of States	Percentage of States	Number of States	Percentage of States
0-20%	6	15.8	8	21.1
21-40%	7	18.4	10	26.3
41-60%	3	7.9	2	5.3
61-80%	5	13.2	6	15.8
81-100%	17	44.7	12	31.6
TOTALS	38	100.0%	38	100.1%

The more traditional forms of environmental education--nature study, outdoor education, and conservation education--were more commonly noted for elementary schools than for secondary schools (Table 6). Nature study leads the rankings in elementary schools, being listed on 84.6% of the response forms, but is at the bottom of the secondary school rankings at 38.5%. Outdoor education shows a similar decline (from 66.7% to 43.6%), though not as dramatic. Conservation education also shows a decrease from elementary to secondary levels, though of a still lesser magnitude (from 66.7% to 53.8%).

TABLE 6

Comparisons between Elementary and Secondary Schools in Common Forms of Environmental Education Noted (N = 39 States responding)

	Elementary Schools		Secondary Schools	
	Number of States	Percentage of States	Number of States	Percentage of States
Nature Study	33	84.6	15	38.5
Outdoor Education	26	66.7	17	43.6
Conservation Education	26	66.7	21	53.8
Population Education	7	17.9	17	43.6
Energy Education	27	69.2	31	79.5
Marine Aquatic Education	16	41.0	20	51.3
SSTE Education	8	20.5	31	79.5

Energy education was reported as a commonly employed form of environmental education in elementary schools (69.2%), and even more so in secondary schools, where it achieved the highest level of response of all forms listed (79.5%). When looked at across the K-12 board, energy education appears to be the most commonly employed approach to environmental education in the United States.

Marine/aquatic education was more frequently listed as a common form of environmental education in secondary schools (51.3%) than in elementary schools (41.0%); it appears that proximity to a seacoast or to the Great Lakes is a dominating factor as to whether or not it was listed at either level.

Population education was much more frequently listed as an area of emphasis in secondary schools (43.6%) than in elementary schools (17.9%). However, responses to this survey indicated that the greatest contrast between elementary and secondary schools with respect to commonly employed forms of environmental education is in the science/society/technology/environment area. For elementary schools, S/S/T/E was noted by 20.5% of respondents, while 79.5% listed it as a common form of environmental education in secondary schools. Even though they listed it as a commonly employed form, two respondents suggested that this area is more appropriately referred to as science/technology/society education (S/T/S), the more frequently used term in professional education circles. The S/S/T/E term was used in conducting this survey because of the centrality and preponderance of environmental topics in most, if not all, published S/T/S rationales and curricula (Disinger, 1986).

State Education Agency Policies

Eight of the 40 respondents (20.0%) indicated "yes" in response to the question, "Does your agency have a policy, formal or informal, with respect to the scheduling in either or both elementary and secondary schools?" In each case, "infusion" was identified as the required mechanism. Of the 32 who indicated that their states had no stated policy in this regard, 6 (15.0%) specified that environmental topics must be included in school curricula, though manner of inclusion remains a local choice. An additional 10 states (25.0%) recommend inclusion of environmental topics in K-12 curricula; generally, the statements of respondents suggest that infusion is the probable mechanism. The remaining 16 respondents (40.0%) indicated that their states had no policies in this area. Table 7 summarizes these data.

Respondents' Comments

The open-ended nature of the survey instrument provided many opportunities for individual comments by respondents; some are of particular interest. Excerpts from the comments include:

Peggy Cowan, Alaska Department of Education: Some environmental education that is going on is not intentional. Many local studies or native studies units are environmental education approaches, without the teacher purposely choosing to do environmental education... Because of the settings of schools and communities, environmental education activities are often used as a doorway to traditional subjects and instruction in Alaska...Many of the quality programs and activities being used in Alaskan schools are available because of the cooperation of agencies, universities, and non-profit organizations... Secondary science and social studies curricula and texts often provide barriers to integrated teaching and environmental education, in Alaska as elswhere...

Table 7

Policies of the State Education Agencies with Respect to the Scheduling of Environmental Topics in School Curricula
(N = 40 States responding)

	Must be Infused	Must be Included	Inclusion Recommended	No Policy
Alaska				X
Arkansas				
California	X			X
Delaware				X
Florida			X	
Georgia				X
Hawaii			X	
Idaho			X	
Illinois				X
Indiana				X
Iowa	X			
Kansas				X
Kentucky			X	
Louisiana				X
Maine			X	
Maryland			X	
Massachusetts				X
Michigan			X	
Minnesota		X		
Mississippi				X
Missouri	X			
Montana		X		
Nebraska				X
Nevada		X		
New Hampshire			X	
New Mexico				X
New York		X		
North Carolina		X		
North Dakota				X
Ohio		X		
Pennsylvania	X			
South Dakota				X
Tennessee	X			
Texas	X			
Utah				X
Vermont			X	
Virginia	X			
Washington	X			
Wisconsin			X	
Wyoming				X
TOTALS	8	6	10	16
PERCENTAGES	20.0	15.0	25.0	40.0

Bill Fulton, Arkansas Department of Education: All (Arkansas) state course content guides contain EE skills. Schools are required to use the state course content guides...

Rudolph J. H. Schafer, California Department of Education: Environmental education is required, by the State Education Code, in all appropriate grade levels and subject matter fields, with emphasis in the areas of science and social studies. We assume that all local education agencies include the required emphasis. The state Science Framework Addendum and other recommended publications emphasize environmental concepts. The state testing program includes questions relating to EE, and local agencies structure programs to conform to this program...There is pressure from the state level to teach appropriate EE concepts as a part of the K-12 instructional program...We are perhaps unique in that we have discretionary funds supplied through the sale of personalized license plates which permit us to fund a great many local programs which encourage innovative and exploratory programs...

John C. Cairns, Delaware Department of Public Instruction: (Our agency) has no policy with respect to the scheduling of environmental education, but we are trying to get one.

Martha M. Green, Linda K. Harageones, Jack M. Hopper, Florida Department of Education: Environmental education topics are infused into curriculum frameworks in science (6-12). There are 18,000 students, 9-12, enrolled in Ecology or Environmental Education...The Florida Council on Comprehensive Environmental Education has recommended that the Environmental Education Policy Advisory Committee adopt a policy that environmental education be included in all subject area curricula, pre-K-12. Efforts are underway to fund such curriculum development.

Gwen Hutcheson, Georgia Department of Education: Environmental topics can be found throughout the curriculum in both science and social studies...in an infused model...The science and social studies coordinators have been very much aware of the importance of environmental issues and the need to be sure that these topics are infused throughout the curriculum at appropriate places in science and social studies. We have been part of a ten-state consortium coordinated by the Social Science Education Consortium, Inc., in Boulder, Colorado, to develop curriculum for Science/Technology/Society for K-12 grade levels. We have served on state committees cooperating with environmental and conservation groups.

Katherine T. Kawaguchi, Hawaii Department of Education: Our state has a strong marine education and outdoor education program for the elementary schools. However, the secondary curricula and studies dealing with the unique terrestrial ecosystems of our islands still need to be addressed.

Richard Kay, Idaho Department of Education: There are a few separate (environmental) subject courses (in secondary schools), but it does not appear to be a trend...Our agency has an informal policy encouraging infusion of EE in all schools, in all subjects...We attempt to give every teacher the opportunity to get additional training in EE to encourage the infusion of topics in their classes. Summer workshops and inservice courses we use include Project WILD, Project Learning Tree, Investigating Your Environment, the CLASS Project, etc.

Don Roderick, Illinois State Board of Education: State law requires that EE be taught; however, it may be included with other subject material..."Conservation Education" is often the term used, in place of "Environmental Education"...Some high schools have EE courses, or include it as a basis for a science offering...Specific topics should be identified that give some operational definition of EE. Everything could be considered EE, if one wished to argue the topic.

Joe E. Wright, Indiana Department of Education: Although we stress infusion, we have state approval for three courses at the high school level: Environmental Science, Environmental Studies, and Energy Resources. High school teachers have the option of teaching these, rather than infusing environmental education into their other curricula. The Environmental Science and/or the Energy Resource courses can count as one of the two required science courses which students need to graduate...We also provide special funding to teachers/schools to design summer environmental science programs; we pay 100% of teacher salaries...All classroom teachers (K-6) are required to teach science, and EE has been infused at all grade levels.

Duane Toomsen, Iowa Department of Education: Although state law requires "Conservation of Natural Resources and Environmental Awareness" be taught as a part of science, grades 1-12, I am convinced it doesn't always happen...We encourage infusion of OUTLOOK, Project WILD, ENERGY, and Project Learning Tree in existing (elementary) curricula...One quarter of our high schools offer a course called "environmental problems," or something similar in name. However, all students are not required to take this course where offered...Many biology teachers and geology teachers infuse EE. Energy is an important part of science, home economics, industrial technology, and social studies. We also have materials for creative and language arts, and mathematics...The teaching of EE varies considerably from one school to another because of teacher interest and training. Our inservice efforts attempt to reach 10% of our teaching population annually...County conservation board naturalists do an excellent job as resource people to provide for some teachers' lack of training. They serve primarily as resource people to the students, and are used extensively.

Ramona J. Anshutz, Kansas Department of Education: We have a very strong Kansas Advisory Council for Environmental Education (KACEE)...

Ann Seppenfield, Kentucky Department of Education: (Elementary) teachers in Kentucky must integrate EE into their regular courses of study, because they are required to teach a specific number of minutes per subject. The most common form of EE is probably S/S/T/E education, and it is probably taught using science textbooks. Some of the high schools are participating in a program called Water Watch, which encourages local communities to learn about their water resources and to learn about the quality of the water. Field manuals are provided to Water Watch groups, and resource people from the Kentucky Division of Water (sponsors of the program) provide technical assistance...Some schools do offer special elective courses in EE through the science program...Until 1984, there was an environmental education mandate that required EE, grades K-12, in the schools of the Commonwealth. EE is no longer required but is included by schools as an option. We have an insert on EE in the state's Program of Studies, curriculum guidelines for all public schools...Kentucky has pockets of EE programs that involve entire school systems; some school systems, however, do little or nothing...

James Barr, Louisiana Department of Education: Secondary curriculum guides have EE integrated into objectives at both cognitive and affective levels...(Our agency) currently has no policy with respect to the scheduling of EE. We are anticipating state legislation to promote environmental education next year.

Thomas Keller, Maine Department of Education: As part of the Maine Education Assessment tests at grades 4, 8, and 11, we ask questions on ecology and environment. These questions are developed or approved by a teacher-based advisory committee. Students routinely do poorly on this section, leading us to say that ideas seem to be taught piecemeal or in isolation...By testing ecology and environment in these tests, we have informally encouraged these topics...We have a very active Project Learning Tree chapter here...and an active Maine Energy Education Program. The Maine Audubon Society has an NSF grant for teacher training in natural history, which is a popular K-12 program...Elementary teachers feel overburdened already, and will infuse (environmental topics) if time and their interest allow...Some secondary schools have environmental science courses, but most do not. Maine does not specify which sciences students must take to satisfy their two-credit graduate requirement...

Gary Heath, Maryland Department of Education: EE is addressed as a major goal in state curriculum frameworks for science and social studies, as well as EE. The frameworks provide direction for schools as they develop their curricula...Unfortunately, just because it's in the curriculum doesn't mean that EE is taught, especially at the elementary level...Everything, including EE, gets a language arts slant in elementary schools...In secondary schools, EE is the focus in courses such as ecology, environmental science, and aquatic biology, and a major emphasis in biology, earth science, and general science. Some infusion of EE takes place in social studies, but it is spotty, dependent on teacher...

John F. Reynolds, Greater Springfield (MA) Regional Education Center: Massachusetts does not provide a state curriculum or a required course list. Local decisions determine course structure. State tests are now promoting science education in elementary schools, and interest in science is increasing.

Mozell P. Lang, Michigan Department of Education: Environmental Education curriculum is not mandated; therefore, each district's program would vary...In secondary schools, EE would be taught as part of a biology, general science, S-T-S/chemistry, physics, or social studies course...Recommendations (with respect to the inclusion of EE in school curricula) are made in the Michigan K-12 Program Standards of Quality, and in the Essential Performance Objectives for Science Education.

Nancy I. Brown, Mississippi Department of Education, and Jane W. Lunk, Mississippi Science Teachers Association: Certain environmental topics are mandated in the state science curriculum, but this is not extensive... The schools on the Gulf Coast have courses in marine biology, and some schools also teach ecology courses... Most schools would teach any environmental materials by inclusion in other content areas, such as biology.

Robert M. Taylor, Missouri Department of Education: We have a good program but find that we need to keep working at it... We cooperate very closely with the Departments of Natural Resources and Conservation... (We use) required core competencies and key skills, in science and physical education, on the Mastery Management Achievement Tests (MMAT). Also, (we have the advantge of the) excellent work of the Missouri Department of Conservation educational consultants and outdoor skill specialists... The Department of Conservation provides monthly lesson plans, booklets, wall charts, etc., to all Missouri schools...(In terms of policy) EE is considered a major thread or element which goes through the total curriculum...

Ron Gutzman, Nevada Department of Education: State statutes require environmental education to be included in the curriculum of all elementary and secondary schools of the state...Certainly the most used programs (in elementary schools) are Project WILD and Project Learning Tree; I assume that activities are picked from them and similar packages and presented as individual units...(In secondary schools) EE takes place in science classes...In Nevada, there is a recently formed Natural Resources Education Council with Northern and Southern Chapters. These councils support all education efforts that deal with the environment.

William B. Ewert, New Hampshire Department of Education: State board policy recommends that schools include environmental education in all appropriate curriculum areas.

B. K. Graham, New Mexico Department of Education: At one time it was specific in our standards that EE be part of every student's program. We have lost that, and nothing has replaced it...A fairly high percentage of teachers in New Mexico have been trained in Project WILD, not so many in Project Learning Tree.

Barry W. Jamason, New York State Department of Education: We have incorporated an environmental review into all syllabus revisions. To the extent (considerable) that these syllabi drive the achievement, program, competency, and Regents examinations, these objectives included in the revisions increasingly account for EE instruction...We offer an Environmental Syllabus, 10-12, which can be used for 1/2 unit elective credit in either science or social studies...Education law requires that instruction/activity be provided on or around the mandated observance of Conservation Day, re: "trees, shrubs, fish, wildlife, soils, and water." Further, the law says that the Commissioner of Education "may prescribe, from time to time, a course of exercises and instruction in the subjects...(named above)."

Clinton L. Brown, North Carolina Department of Public Instruction: Environmental education is infused into other sciences and separate from all other courses...EE concepts are part of the state standard course of study and are to be taught. Concepts are included in statewide testing in grades 3, 6, 8, and biology... Specific courses in EE are infrequent.

John Hug, Ohio Department of Education: Environmental education is such a broad term that I would have to say that 100% of Ohio schools and 100% of K-12 guides include some EE...Energy and resource conservation is required in Ohio schools...A substantial number of Ohio (secondary) schools offer an elective science course usually entitled "Environmental Science"...Social studies educators nationally and in Ohio are writing about and encouraging the teaching of "science-related social issues" at all grade levels, K-12. These issues are 95% EE...Science educators nationally and in Ohio are writing about and encouraging the teaching of "Science/Technology/Society" activities (issues) in all grades, K-12. These issues are 95% EE...Industrial technology educators nationally and in Ohio are writing about and encouraging teaching about "technological literacy." Some of these issues are EE.

Dean Steinhart and John J. McDermott, Pennsylvania Department of Education: Environmental education is required to be taught each year, K-12. No time guidelines are specified. In the secondary schools, each student is required to have one semester of EE.

Padgett Kelly, Tennessee Department of Education: EE objectives are in the state guides for several subject areas--science, social studies, biology, and health. A good basis for EE would exist if teachers used the guides to drive their teaching, instead of the textbook. Usage of these guides is increasing...Project CENTS is using Project WILD, Project Learning Tree, and the CLASS Project, along with other materials, to aid teachers in EE.

Barbara ten Brink, Texas Education Agency: Texas schools must comply with Texas Education Code 21.101, which lists the skills, processes, and content to be taught in 13 content areas, K-12. Science essential elements list environmental topics K-6; life science and earth science in grades 7-8 list environmental topics; and grades 9-12 courses either list environmental essential elements, and/or students take environmental science as one of their two science courses.

R. LaMar Allred, Utah State Office of Education: EE is most commonly infused into the secondary science curriculum. The most common science courses accommodating EE are our two new S/T/S courses--Physical-Earth Science and Biological-Earth Science.

George Tanner, Vermont Department of Education: (For elementary schools,) the state suggests integration; EE is 1/4 of the suggested (not mandated) science framework for grades K-8...(In secondary schools,) EE is most commonly part of general science and life science programs. A few schools (10-15%) list environmental science as a course offering...About 30 districts use Chapter II funds to purchase contracted services in environmental education from private providers, which utilize a broad base of parent volunteers.

James C. Firebaugh, Virginia Department of Education: The state science framework incorporates environmental science objectives at all grades, K-12. All public schools in Virginia are responsible for implementing these objectives... As elementary schools offer an integrated curriculum, environmental topics overlap the specific content areas. For example, many environmental activities meet objectives in language arts, social studies, and science at the same time...

Tony Angell and David Kennedy, Washington State Office of the Superintendent of Public Instruction: The Goals and Guidelines (for Washington State) emphasize the interdisciplinary nature of EE. Therefore, objectives and learning strategies are written in a manner which encourages this approach. Our curriculum was developed with this in mind...(In secondary schools) EE is infused largely through science, social studies, and language arts...Our agency supports the Common Schools, which are mandated by law to instruct in "science with special reference to the environment," and the "worth of kindness to all living creatures and the land." Furthermore, each school district is mandated by law to offer all "required courses for a high school diploma...and shall provide an opportunity for high school students to take at least one course in the following areas of study...(which includes environmental education)"...Over the past five years, there has been an enormous increase in environmental education by agencies other than the Office of Public Instruction...There is an "infusion" through 4-H, hunting clubs, Scouts, YMCA, and the like. There is no particular requirement to maintain objectivity of content or provide evaluation of results.

David C. Engleson, Wisconsin Department of Public Instruction: I am certain that all districts do something (in EE), but it varies greatly from district to district. By September 1988, school districts will have to incorporate EE into the curriculum plans for all areas, with the greatest emphasis in art, health, science, and social studies...To many educators, teaching "units" is "infusion," but I would call it "insertion," and consider it as separate from the rest of the curriculum as a special course would be. To me, "infusion" means that EE is built into the teaching of just about everything. We are striving for "infusion" of the latter sort in Wisconsin, but I am afraid that most teachers use a unit approach...We have about 70 separate high school courses in environmental studies. As we promote infusion of EE throughout the curriculum, we will not discourage such courses but will try to encourage teachers involved to make them much more issue-oriented than they are currently.

Survey Generalizations

Drawing generalizations from a survey such as the one reported above is chancy, but it is apparent that actual practice with respect to inclusion of environmental topics in the curricula of elementary and secondary schools of the United States is generally through infusion in more established areas of study. As might be expected, elementary schools which include environmental topics in their curricula operate almost entirely on the infusion model; this probably reflects the organizational patterns of elementary schools in terms of self-contained classrooms and significantly less rigidity in time frames, in comparison to secondary schools. Though there are occasional separate course offerings in environmental topics at secondary levels, their numbers do not suggest any large movement in the direction of "separateness" as opposed to "infusion."

Respondents to this survey have indicated that infusion is generally accomplished in association with science curricula in both elementary and secondary schools, though social studies has been identified as a host content area in several cases and other curricula in a few. Differentiation between "infusion" and "inclusion," as described by Engleson (above), was not addressed by this survey.

The reported close association of environmental topics with science curricula may be reflective of a "science bias" (as opposed to a "social studies bias") occasioned by the other, frequently primary, professional responsibilities of the respondents, 23 (57.5%) of whom are also science education specialists; that is, a similar survey conducted among social studies specialists representing the state education agencies might reasonably be expected to report more significant relationships between environmental topics and social studies education than has been found through this survey.

In Summary...

Both the survey and the symposium described in this volume offer ample evidence that the posed question of how environmental education "fits" into school curricula is more complex than it might appear; a range of possible positions and mechanisms are possible, as are a variety of possible content emphases. The evidence of the survey, and the general tenor of the symposium papers, suggests that infusion is the more popular method, primarily due to practical considerations; there is greater likelihood of finding space for environmental topics in school curricula if they can be associated with in-place curricula, rather than carving out space for new ones. It also appears that environment is, from a national perspective, a second-order issue in the schools as well as in the political arena, though there are clearly many state and local situations where it thrives--in varying forms, to be sure. The admonition to "think globally but act locally" (Mann and Stapp, 1982) fits well within this framework.

Many mechanisms for fitting environmental education into school curricula are in place, and successfully so. Conversely, all inclusion mechanisms are open to criticism. It appears that judicious assessment of local possibilities, coupled with careful attention to both content emphases and strategies for seeking inclusion appropriate to the local general and educational environments, bear a greater relationship to defining curricular space for environmental topics than does any particular mechanism of inclusion.

REFERENCES

Commoner, Barry. "A Reporter at Large: The Environment." New Yorker, 46-71, June 15, 1987.

Disinger, John F. A Directory of Projects and Programs in Environmental Education for Elementary and Secondary Schools. Columbus, OH: ERIC/SMEAC, 1972. ED 071 881.

Disinger, John F. A Directory of Projects and Programs in Environmental Education, 3rd Edition. Columbus, OH: ERIC/SMEAC, 1975. ED 114 259.

Disinger, John F. A Directory of Projects and Programs in Environmental Education, 4th Edition. Columbus, OH: ERIC/SMEAC, 1978. ED 135 669.

Disinger, John F. A Directory of Projects and Programs in Environmental Education, 5th Edition. Columbus, OH: ERIC/SMEAC, 1979. ED 187 515.

Disinger, John F. Current Practice in Science/Society/Technology/Environment Education: A Survey of the State Education Agencies. Columbus, OH: ERIC/SMEAC, 1986. ED 281 709.

Disinger, John F., and Woodward S. Bousquet. "Environmental Education and the State Education Agencies: A Report of a Survey." Journal of Environmental Education, 13(3), 13-29, 1982.

Disinger, John F., and Mary Lynne Bowman. Environmental Education 1975: A State-by-State Report. Columbus, OH: ERIC/SMEAC, 1975. ED 121 628.

Disinger, John F., and Beverly M. Lee. A Directory of Projects and Programs in Environmental Education for Elementary and Secondary Schools, 2nd Edition. Columbus, OH: ERIC/SMEAC, 1973. ED 086 558.

Dunlap, Riley E. "Polls, Pollution, and Politics Revisited: Public Opinion on the Environment in the Reagan Era." Environment, 29(6), 6-11, 32-37, July/August 1987.

Mann, Lori D., and William B. Stapp. Thinking Globally and Acting Locally: Environmental Education Teaching Activities. Columbus, OH: ERIC/SMEAC, 1982. ED 229 214.

McCloskey, Michael. "A Second-Order Issue." Environment, 29(9), 2, November 1987.

Udall, Stewart L. "Local Electoral Clout." Environment, 29(9), 2-3, November 1987.

APPENDIX A: Participants in the Symposium

PAUL F. BRANDWEIN is a teacher, scientist, and conservationist. He holds degrees from New York University (B.A., M.S., Ph.D.) and Colorado College (D.Sc.). His professional career includes 12 years of high school science teaching, an appointment as Adjunct Professor of Conservation and Education at the University of Pittsburgh, and extensive activity with Harcourt Brace Jovanovich, including assignments as Co-Publisher and Director of Research.

Paul has been Director of Education for the Conservation Foundation and Director of the Pinchot Institute of Conservation Studies. Among his many publications are Teaching Science through Conservation, Concepts in Science (a text series), Concepts in Social Studies (a text series), People and Environment, and Memorandum: On Renewing Schooling and Education.

CHRIS BUETHE is Professor of Curriculum/Instruction in the Department of Secondary Education at Indiana State University, Terre Haute. He has been a school and college physics teacher, Fulbright exchangee, school principal, and university chairperson. His masters at the University of Colorado and doctorate at the University of Nebraska included theses in science education.

Chris has directed six environmental/energy inservice projects. Results of his environmental literacy studies have appeared in The Journal of Environmental Education and related publications.

CHERYL CHARLES is a teacher, writer, researcher, and curriculum developer. She has earned degrees from University of Arizona (B.A.) in History Education, Arizona State University (M.A.) in Curriculum Development, and University of Washington (Ph.D.) in Curriculum and Instruction.

Cheryl has been a high school social studies teacher and department chairperson and an instructor of teaching methods at the university level. She has been a Staff Associate and Editor at the Social Science Education Consortium, and Associate Director of the ESSENTIA (Environmental Studies for Urban Youth) Project. For eight years she served as national Director of Project Learning Tree and has been national Director of Project WILD since 1981. Among her several honors is the Conservation Education Association's Meritorious Service and Leadership Award in 1985.

DAVID C. ENGLESON is Environmental Education Consultant with the Wisconsin State Department of Public Instruction. He taught high school science and environmental education, and science education methods at the university level, prior to assuming his current position in 1967. His degrees include a B.S. in Natural Science from the University of Wisconsin-Madison and an M.A. in Science Education from The University of Michigan at Ann Arbor. He also has completed course work at several other institutions.

Dave was primary author of A Guide to Curriculum Planning in Environmental Education, published in 1985 by the Wisconsin Department of Public Instruction. Recently he has been active in planning the Education Track of Globescope Wisconsin 88, a major conference dealing with global environmental issues and how they impact on Wisconsin's environment and economy. He also serves as a consulting editor to The Journal of Environmental Education.

WILLIAM F. HAMMOND is Director of Environmental Education and Instructional Development Services for the Lee County School District, Ft. Meyers, Florida. He earned B.S. and M.S. degrees in science education from the State University of New York at Cortland and an Education Specialist certificate from the University of South Florida; he is currently completing doctoral studies in education at Simon Fraser University, Burnaby, British Columbia.

Bill has had nearly 20 years of highly successful experience with environmental education with the Lee County schools, including an ESEA Title III grant, three grants under the U. S. Office of Education's Environmental Education Act, and a number of State of Florida minigrants. He was a member of all Florida Advisory Councils for Environmental Education since 1971, serving as chair in 1986-87. In addition, he was President of the Alliance for Environmental Education during 1982-83, an officer and board member of the Conservation Education Association, and Chairman of the Human Habitat Project.

PAUL HART is an Associate Professor in Science Education at the University of Regina, Saskachewan. He taught science and biology at elementary and secondary levels and worked in the Provincial Department of Environment before completing a Ph.D. in curriculum and instruction (science and environmental education) at Simon Fraser University, Burnaby, British Columbia.

Paul has recently completed a study of science education which has resulted in policy proposals for K-12 curriculum renewal in Saskatchewan. He is a member of the publications board of the Canadian Plains Research Center, has acted as program director for graduate studies in the Faculty of Education, is currently Director of the Saskatchewan Instructional Development and Research Unit, and is a member of the Board of Directors of the North American Association for Environmental Education.

JERRY HODGE is Principal of the Boyne River Natural Science School, Shelburne, Ontario, and the Toronto Urban Studies Centre, both of which are units of the Toronto, Ontario, School System. He holds a

B.A. from the University of Toronto and an Honour Specialist Teaching Certificate in Biology from the Ontario College of Education. Subsequently, he has obtained a Masters Degree in Education from the Ontario Institute of Studies in Education.

Jerry's commitment to environmental issues stems from his classroom work and a strong interest in whitewater canoeing, which has led him into many areas of Canada's wilderness. He prepared his symposium presentation in collaboration with Charles Hopkins, former Principal of the Boyne River School, presently Toronto Superintendent of Schools, and a noted Canadian and international environmental educator.

HAROLD R. HUNGERFORD is a Professor in the Department of Curriculum and Instruction at Southern Illinois University at Carbondale and Coordinator of the Science Education Center in that department. He has been a professional educator since 1949 and a member of the SIU faculty since 1965.

Harold is a prolific educational researcher, with much of his work in the area of investigative and action skills. He is author or co-author of several texts and curriculum guides and is among the most productive mentors of environmental education researchers and curriculum specialists in the United States, perhaps in the world. He has been a contributor to the efforts of NAEE's North American Commission for Environmental Education Research since its inception and received NAEE's Walter E. Jeske Award for Outstanding Service in 1983.

LOUIS A. IOZZI is Associate Professor of Science and Environmental Education and Chairman of the Education Department at Cook College, Rutgers University, New Brunswick, New Jersey. He earned a bachelor's degree in science education and elementary education (Kean College of New Jersey), a master's degree in geology (Montclair State College), and a doctorate in science and environmental education (Rutgers University), followed by post-doctoral study at Harvard University. His teaching experience ranges from elementary school through graduate university levels.

Lou has authored or co-authored more than 80 books, monographs, and journal articles dealing with science, environmental education, and science-technology-society issues. He has chaired NAEE's North American Commission for Environmental Education Research since its formation and is currently President-Elect of the North American Association for Environmental Education.

MILTON McCLAREN is an Associate Professor of Education and an Associate Member of the Faculty of Science (Biological Science) at Simon Fraser University, Burnaby, British Columbia. A former Dean of the Division of Continuing Studies and Director of the Professional Development Program for teachers, he is currently coordinator of Simon Fraser's Environmental Education program. Additionally, he is a member of the Man and Biosphere Committee and the MAB Network Committee of UNESCO-Canada and a member of the Project WILD Steering Committee.

Milt earned a B.S. in Botany and Zoology, and a Ph.D. in Microbiology, from the University of British Columbia. He chairs Simon Fraser's Animal Care Committee, which is responsible for the ethics of experimental and teaching procedures involving live animals. He is involved in the training of Peace Education Associates for the British Columbia Teachers Federation and developed the university's summer institute programs in Environmental Education and Science, Society, and Technology.

IAN ROBOTTOM is a Senior Lecturer in the Curriculum Studies Centre of the School of Education at Deakin University, Victoria, Australia. He taught science and biology in secondary schools in Melbourne before joining the State College of Victoria at Geelong as a lecturer in science methods and environmental studies. His Master of Education thesis at the University of Melbourne was on innovation in the science curriculum. He joined Deakin University in 1977 and completed his Ph.D. on environmental education as educational reform.

Ian was an evaluator of the Curriculum Development Centre's Environmental Education Project and a member of the Council of the Australian Association for Environmental Education, editor of the Australian Journal of Environmental Education, and editor of Environmental Education: Practice and Possibility, published by Deakin University Press (1987).

PETER A. RUBBA JR. has been an Associate Professor of Science Education and Director of the Center for Education in Science, Technology and Society, in the Division of Curriculum and Instruction at The Pennsylvania State University since 1984. His prior experience includes eight years in science education at Southern Illinois University, as well as chemistry, physics, and general science teaching experience.

Pete holds a B.S. degree in Chemistry from Ashland College and an M.A. in History and Philosophy of Science and an Ed.D. in Science Education from Indiana University. His research interests include STS education, science teacher education, and citizen scientific and technological literacy.

BOB SAMPLES is an independent scholar whose initial training was in the sciences of geology, geophysics, and astronomy. His move to psychology, creativity, and brain function resulted from work with

George Gamow and Jerome Bruner in the late 1950s and 1960s. Since 1961, the major emphasis of Bob's work has focused on the origins of creative thought. His work continues in local, state, national, and international contexts.

Bob has authored or co-authored seven published books, with several others in final revision stages. He has published more than 150 articles in journals, magazines, and collected works, contributed papers to more than 20 books of readings, and authored and consulted on more than 20 award-winning films. Currently his research interests continue in brain-mind function, night dreaming, and the conceptual base for planetary consciousness.

RUDOLPH J. H. SCHAFER is a native Californian, a graduate of the University of California (B.S.) and University of Southern California (M.S.) He worked as a classroom teacher, Public Information Officer, and Conservation Education Specialist for the Los Angeles City Schools (1950-1967), and served as Environmental Education Program Manager for the California State Department of Education from December 1967 until his retirement in May 1987.

Rudy is the founder and current Executive Director of the Western Regional Environmental Council, producers of Project Learning Tree and Project WILD. He served two terms as President of the Alliance for Environmental Education and during the 1970s was a member of the National Environmental Education Advisory Council, U.S. Office of Education. He is a past member of the Board of Directors of the North American Association for Environmental Education and was recipient of the organization's Walter E. Jeske Award for Outstanding Service in 1986.

KAY MONROE SMITH is an Assistant Professor of Curriculum and Human Resource Development at Loyola University of Chicago. She taught in Chicago area schools and the Headstart Program before joining the Loyola faculty in 1980. Her degrees include a B.S. from Concordia College, an M.A. from Northwestern University, and a Ph.D. in curriculum from Loyola.

Kay has directed Loyola's Elementary and Secondary Teacher Education program and presently teaches mathematics methods and graduate curriculum courses. She is currently investigating parental involvement in learning under a grant sponsored by the Illinois Board of Higher Education. A recently completed text, The Home as Learning Center: The Family as Educator, co-authored with Meg Carroll, has been scheduled for publication by Kendall-Hunt Publishing Company.

APPENDIX B: Respondents to the Survey

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Note: Reports were not received from:

- Alabama
- Arizona
- Colorado
- Connecticut
- New Jersey
- Oklahoma
- Oregon
- Rhode Island
- South Carolina
- West Virginia

APPENDIX C: SURVEY QUESTIONNAIRE

Respondent ______________________________
Name Title

Address ______________________________

____

____
City State Zip

Telephone ______________________________

_____ I am not the appropriate person from whom to secure this information. Please contact:

____
Name Title

Address ______________________________

____

____
City State Zip

Telephone ______________________________

Please respond to the questions below as best you can. Use data where possible. Semi-objective or subjective responses will also be helpful.

1. To what extent is environmental education included in the curricula of K-12 schools in your state?

Percent of Schools	Elementary Schools	Secondary Schools	All K-12 Schools
0- 20%			
21- 40%			
41- 60%			
61- 80%			
81-100%			

Are the above responses: ____ based on data?
____ estimates?

Comment:

2. Please check the forms of environmental education which are most commonly employed. If possible, indicate which are most common and which are least common.

	Elementary Schools	Secondary Schools	All K-12 Schools
Nature Study	______	______	______
Outdoor Education	______	______	______
Conservation Education	______	______	______
Population Education	______	______	______
Energy Education	______	______	______
Marine/Aquatic Education	______	______	______
Science/Society/ Technology/Environment Ed.	______	______	______
Other (specify) ______________	______	______	______

Comment?

3. In the elementary schools of your state, which format(s) are most commonly used for the inclusion of environmental education--infused in other content areas, scheduled as a separate subject, somewhere in between? Please discuss your response as you feel appropriate.

Infused __________

Separate __________

Discussion/Comment?

4. In the secondary schools of your state, which format(s) are most commonly used for inclusion of environmental education--infused in other content areas, scheduled as a separate subject, somewhere in between? Please discuss your response as you feel appropriate.

Infused __________ (If so, in which content areas?)

Separate __________

Discussion/comment?

5. Does your agency have a policy, formal or informal, with respect to the scheduling of environmental education in either or both elementary or secondary schools? If so, please explain briefly. If the policy is a part of a more general policy, please explain briefly.

6. The questions above may not adequately address all of the pertinent considerations with respect to the scheduling or inclusion of environmental education in the schools of your state. If such is the case, or if you have additional comments, please provide them below.

THANK YOU FOR YOUR HELP!

We will provide a copy of the summary report developed from this information to all respondents, which will also include the symposium papers described in the cover letter.

PLEASE RETURN YOUR COMPLETED SURVEY FORM BY SEPTEMBER 8, 1987. MANY THANKS!

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